

CHARACTERIZING THE GAP BETWEEN STRATEGY AND IMPLEMENTATION

Edited by

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Brightline
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system design & management

About Brightline Initiative

Brightline™ is a Project Management Institute (PMI) initiative together with leading global organizations dedicated to helping executives bridge the expensive and unproductive gap between strategy design and delivery. It delivers insights and solutions that empower leaders to successfully transform their organization's vision into reality through strategic initiative management.

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It is with great pleasure that we announce the publication of this new book *Characterizing the Gap between Strategy and Implementation* – a collaboration between the Brightline™ Initiative and the System Design & Management Group at the Massachusetts Institute of Technology (MIT).

The book is the result of an academic conference held at the MIT campus in the spring of 2018. Over two days a diverse group of researchers, practitioners and mid-career graduate students debated issues and practices related to strategy implementation. We are very grateful to Dr. Bryan Moser and Dr. Eric Rebentisch for their contribution in advancing this topic and the academic collaboration with the Brightline Initiative.

The Brightline Initiative is a Project Management Institute (PMI) initiative together with leading global organizations. It is dedicated to help business and government leaders to bridge the expensive and unproductive gap between strategy design and delivery, between ideas and results. It delivers insights and solutions that empower leaders to successfully transform their organization's vision into reality through strategic initiative management.

The Brightline Initiative focusses on 'practice' as well as 'thought'. This approach complements our goal to bridge the gap between strategy and delivery. We provide organizations with three key benefits: thought and practice leadership, capability building and networking.

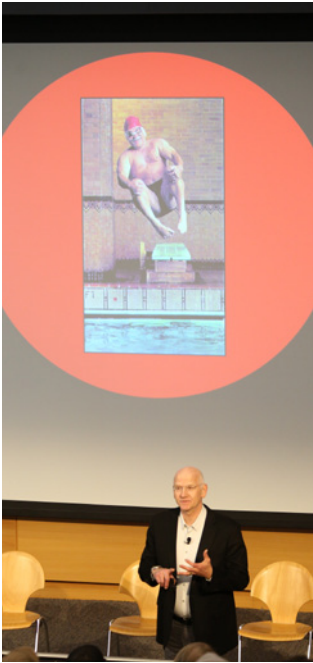
Over the past two years, we have built a global community of researchers and thought leaders from premier institutions. We collaborate and support research initiatives aimed to explore and create new insights and practices to help organizations transform ideas into reality more effectively.

Available free of charge, the book is designed for leaders managing transformation initiatives in civil society, organizations and governments.

We hope you enjoy reading it.

Ricardo Viana Vargas
Executive Director, Brightline Initiative





Introduction

The last century has witnessed a rapid increase in global population, mobility, urbanization, and commerce. These changes have been fueled by natural and human engineered ecosystems which are increasingly connected, large, and impactful. As billions of people have been lifted from poverty with access to services, liberties and education, new challenges emerge and risks confront us.

Organizations both public and private – in response to this remarkable period of complexity – struggle with established notions of organizational development, culture, and performance. What is our mission? What should we do? Should we? Can we? With whom? For whom? Our established frames – identity, roles, capabilities, and intuitions, even our way of seeing the world – may fail us.

What should be our response to this age of connected complexity as practitioners, thought leaders, and researchers? These times push us beyond our traditions to consider heretofore unreachable objectives. Yet even as targets increase, so do the uncertainties of their achievability. Across our networked world, now how should one share value, work, and risk? The connectedness that enables new achievements simultaneously introduces difficulty. What is our response? Put simply, we must build capabilities to bridge an increasing gap between strategy and implementation.

In the spring of 2018 a diverse group of researchers, practitioners, and students gathered for a two-day symposium titled “Characterizing the Gap between Strategy and Implementation.” This book captures the results of this event.

A Call for Dialogue

A symposium was held on the MIT campus on April 30 and May 1, 2018. Researchers and practitioners submitted original work characterizing the gap between strategy and implementation, including theory, applied research, and cases. As an exploratory initial symposium, emphasis was placed on new research frameworks and crosscutting themes. The participants were asked to demonstrate open mindedness through the two days, given the diverse set of backgrounds from both multi-disciplinary academic and professional experience. The event was hosted by the MIT System Design and Management (SDM) and sponsored by

The Brightline™ Initiative. SDM is a joint program of the MIT School of Engineering and Sloan School of Management. For more than 20 years, SDM has been a leader in innovative education and research which integrate management strategy and engineering implementation. The Brightline™ Initiative is a Project Management Institute (PMI) initiative together with leading global organizations dedicated to helping executives bridge the expensive and unproductive gap between strategy design and delivery.

Topics of Interest

In the spirit of a working research symposium, papers, posters, panel discussions, and workshops on the following topics were prepared:

- Research-based investigation into factors which drive separation or promote integration between strategy and implementation functions in organizations
- Models-based approaches of strategy for implementation teams
- Models-based approaches of implementation for strategy teams
- Case studies of high-performance teamwork that spans strategy and implementation
- The epistemology, ontology and semantics of strategy, with an emphasis on setting and cascading of targets so as to guide implementation activity.
- Simulation methods for cascading leadership team choices, organizational constraints and strategic directives across units to managers and employees.

The Motivation

Strategy has been well studied, ranging across perspectives including visions of future and goal-setting, competitive differentiation, process excellence, and core competencies. At the same time, many have explored performance during implementation, from project management and teamwork to learning and operational efficiency. Yet evidence and experience suggest that the strategic success of professional practices remains disparate. The gap between strategy and implementation function of firms remains large. This event brought together practitioners and researchers in an intentionally diverse – and even awkward – mix.

Thus, we chose to focus this first symposium on *characterizing* the gap between strategy and implementation. Over two days the event combined 3 keynotes, 2 panels, 20 presentations, 14 posters, and 3 workshops. More than 150 participants, well balanced across industrial and academic backgrounds, many of whom had not met before.

Across formal papers, some included in this book, panels, workshops, and countless conversations before and during the symposium, some insights emerged and unanswered questions highlighted.

Many of our colleagues called for common vocabulary and formal ontology to anchor our explorations. Model-based frameworks might allow integrated simulation of strategy and implementation. Field studies and experiments which treat phenomena most typical in studies of strategy could simultaneously consider project, resource, and behaviors typically treated in studies of implementation.

It was recognized that stronger social science experimental methods will be required prior to claims often witnessed in survey-based management publications. More broadly, model-based and experiment-based academic work might go beyond broad frameworks to emphasize measurable and reproducible treatment of the underlying phenomena of teams working on strategy and implementation in firms. Various means to instrument activity on the bridge between strategy and implementation functions of firms were discussed.

Ultimately, the participants envisioned co-creation of strategy and implementation to match the context, stakeholders, demands, and capabilities of a given situation. They wondered if it might be possible to detect healthy patterns of behavior in teams of teams working on the strategy-implementation boundary. Still, doubts were raised about tightly controlled toy problems – reduced so as to allow measurement – oft repeated; where their mathematical significance might be claimed, the underlying representations so weak as to demonstrate simply that the experiment itself was studied, rather than the reality intended.

After a fascinating and motivating few days of diverse voices, both theoretic and experienced, the group adjourned with humility and caution, to pursue concrete means to characterize the strategy-implementation gap. The chapters of this book are a record of some of these discussions, and we hope a guide before our next gathering.

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April 2019

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The Missing Links in Strategy to Implementation: A Greater Systems View

GEORGE ROTH AND ERIC REBENTISCH

Massachusetts Institute of Technology, Center for Engineering Performance
Excellence

Introduction

It was a disaster that ended an era of military dominance and likely control of all Europe. The plans were made, the French soldiers ready, and destined to defeat the British army. Napoleon's battlefield strategies had won him many wars. However, a mistake in implementation – delaying the attack – led to Wellington's historic victory at Waterloo [1, 2]. More recently, General Electric, a perennial best performing company and the longest initial member of the Dow Jones Industrial Average, fell out of that index because of its inability to implement strategy. The firm had become unable to “continually improve their value equations with customers.” [3]

These tales from the past and present all illustrate the challenges of strategy implementation. Challenges arise when leaders are making decisions at one time and place and the efforts to carry them out are with others elsewhere in another time and place. Whether that elsewhere is in another galaxy or organization, these are recurring parallels for strategy and its implementation in business organizations. These failures are not exceptional instances; they are illustrations of a consistent challenge, and one that has been, according to recent surveys, found to be endemic to nearly all managers. In the Economist Intelligence Unit's 2017 survey of over five hundred senior executives from large, global multi-sector companies,¹ ninety percent of managers admitted that they fail to reach all their strategic goals *because* they do not implement well. Why? According to the survey, these executives cited 1) failures to understand the company, its environment and its abilities to execute (65%); 2) inadequate delivery capability (53%); 3) inability to translate the results of strategy development into its effective implementation (59%); and 4) just poor implementation of strategic directives (20%). *Only* a small ten percent of the executives reported no significant difficulties in the preceding three years for achieving their strategic goals. What were the financial results for those one-out-of-ten companies? Not surprisingly their results were significantly better than those of their industry rivals [4, 5].

The aforementioned issues are the motivation for the *Characterizing the Gap between Strategy and Implementation* SDM Symposium for which this paper is written. This and other papers in this book resulting from the symposium address various aspects of the strategy-to-implementation challenge, drawing upon existing research, reviewing what has been settled in the literature, and striving to collect and propose the theory and principles that promise better outcomes. In this paper we focus on what happens between the formulation of strategy and the management of the projects, programs and activities that are created to carry out strategy. That area is also the focus for the MIT Strategy Implementation Research Project,

which has various research, writing and method development efforts underway that seek to improve strategy-to-implementation efforts. We take on this focus as a way to investigate other aspects of an organization's strategy cycle that influence what happens in strategy-to-implementation activities.

We have two explanations for beginning with implementation for studying and improving an organization's strategy cycle. The first reason is pragmatic – we see strategy-to-implementation as the time and place to begin to collect information, diagnose and contribute improvements, and then examine an organization's strategy cycle, including its decisions and their implications. The second reason is opportunistic – given the repeated findings, strategy-to-implementation seems to be problematic for managers and insufficiently studied by academics. There are numerous, well-developed methods and approaches for formulating strategy, and an extensive literature along with specified methods and training programs for effectively managing programs, projects and activities. We see the need to focus on the territory between that formulation of strategy and setting of goals and the execution of the activities associated with getting to those goals, or what we call the strategy-to-implementation territory.

Approach for strategy-to-implementation

Where might we look for insights into improving strategy-to-implementation? In reviewing social science research, we identified several theories and principles that aptly apply to strategy-to-implementation. These concepts both guide further research and provide immediate guidance for leaders. While there is social science research in the relevant areas of designing organizations, creating strategy, developing leaders, effective decision-making, and managing teams and organizations, we focus on three of these literatures for strategy-to-implementation: Systems Theory, Sociotechnical Systems and Organizational Learning. Systems Theory treats an organization as a system with a set of distinct parts that form a complex whole. Sociotechnical Systems focuses on the interaction between technology and people to guide the design of organizations and work. Organizational Learning focuses on people and process for creating, retaining, and transferring understanding and knowledge within and across organizations. Each of these areas of organizational research applies directly to strategy-to-implementation. What follows is a summary of each literature, and then synthesis and integration of these concepts to guide further study and practice of the strategy-to-implementation territory.

Systems Theory

Systems theory evolved from efforts to understand behavior and outcomes in both physical and social realms [6, 7]. Systems theory encompasses a wide field of research with multiple conceptualizations and different areas of focus [8]. The application of systems theory to organizations and their management holds to several premises – holistic attention in the understanding of organizations is not the same as an understanding of its various and discrete,

multiple elements [9, 10], and an understanding of the relationships among elements is as important as those elements themselves [11, 12, 13]. This theory develops the concepts of homeostasis, equilibrium, self-regulation, equifinality and autopoiesis as processes that regulate and transform behaviors in systems [8, p. 129]. The implications for organizations and management from system theory is the focus on 1) nested systems – where a system is a unit of analysis and every system is within supra- and sub-systems [14]; 2) open systems – the attention to relationships between organizations and their environment [15, 16]; and 3) feedback and cybernetics – the source and consequence of information and action taking place within the system are foundations for changes [17].

Systems principles suggest that the behaviors found in implementing strategy may be studied and better understood by applying these aforementioned orientations. First, a nested systems orientation proposes an examination that is one level above and one level below what happens in strategy implementation activities. For one level below, this would inquire into the strategy team at the level of its individual members, and their selection, behaviors and characteristics, particularly those influencing learning and performance. At one level above the strategy implementation, this involves examination of organizational arrangements and how they influence strategy-to-implementation. Examples of these organizational arrangements are an organization's culture, routines and structure, and their influence on behaviors, events, patterns at organizational levels, including formulation and communication of strategy, as well as planning and execution of strategy. We have seen these boundary-spanning parallel structures, or “bridging units,” create incremental and ongoing performance benefits.² These are organizational units, such as a Program Management Office, made up of people representing various divisions, functions, and geographies that guide the development, training and use methods across their organization.

An open systems view places attention on the outside influence on the organization and its internal activities, including its exchanges of energy, matter, people, and information with the external environment. An organization's adaptation to new conditions can both contribute to and result from changes in the environment. A feedback view examines flows of information, where individuals' purposeful behavior, social construction, distortion, and delays filter and alter information in ways that attenuate and amplify behaviors in the system, particularly in the ways that endogenous factors influence its ability to adapt to new conditions.

The challenges found in embracing the complexity inherent in systems views have been addressed by developing and testing computer-based systems dynamics models. The models are used to simulate what might happen so that people can explore the consequences of alternative actions given system conditions, often in the context of a “managerial practice field,” which we describe in the subsequent section on learning organizations [18]. Systems theory suggests going beyond elements to developing overall representations of systems. A model and information, created by capturing, representing and modeling information flow, material movement, and work processes, give an overall view of a system. These models allow for analysis by using concepts and methods for reducing variation (quality methods [19]), improving

throughput and flow (lean methods [20]), or by identifying and eliminating bottlenecks (theory of constraints [21, 22]) that enable planned and continuous improvement activities.

Sociotechnical Systems

The term “sociotechnical systems” was introduced based on the realization that neither social nor technical systems could be effectively developed in isolation. Techniques and technology had to be considered and developed in combination, using an understanding of human behavior while also involving the people impacted [23, 24]. Sociotechnical systems theory is an open systems view, developed from the insights into unpredictable behaviors that arose from introductions of new technology. There are two main components of a firm as a sociotechnical system: a social component (e.g. people), and a technical component (e.g. techniques, technology and machines) [25]. These ideas had their origins in coal mines [26], and through their development and application in many settings over multiple decades (extractive industries, agriculture, manufacturing, government, business, and services), were developed as principles for the integration of social and technical domains that achieve and sustain better outcomes.

How does strategy and its implementation relate to the industrial settings in which sociotechnical systems approaches developed? Organizations, and the design of their work and processes, are techniques developed and purposefully designed to achieve particular outcomes. Strategy-to-implementation activities link decision-making in the formulation of strategy and guidance in goals to projects, programs, policies, budgets and other activities that people do to carry out that strategy. In the strategy-to-implementation setting, the technology is not manipulating raw materials and physical goods, but it is techniques or technologies that capture and manipulate data, information and knowledge as part of a company’s business processes.

In navigating strategy-to-implementation, sociotechnical systems principles examine the organizational arrangements that join decision-makers and technical systems with those asked to take action and adjust their work and goals. These principles suggest that this be done in ways that inform and guide people’s activities, and generate feedback to those decision-makers. Three sociotechnical systems principles – responsible autonomy, adaptability, and meaningfulness of tasks [27, 28, 24] – provide a basis for the design of organizational arrangements that promote effective interactions among people. Each of these principles can be translated from an industrial context for adaptation to strategy implementation.

Responsible autonomy³ is based on insights from how technology changes social patterns, and addressing those changes by forming groups that are given direction and resources to design their activities. In this application, responsible autonomy would give people that are impacted by a strategy some direction, resources and opportunities to participate in associated planning and implementation activities.

Adaptability⁴ is based on insights that change creates conditions that are impossible to predict, so that people need to be given some freedom and ability to draw upon their aspirations to then make adjustments that can achieve desired targets.⁵ The application of adaptability to strategy implementation would have managers and workers engaged in prototyping implementation plans, with leaders providing feedback, guidance and support as they went forward.

Meaningfulness of tasks⁶ is based on recognition that people's experience within systems is important to sustaining performance. Related research has identified, measured and applied meaningfulness as part of "core job characteristics." [29] Applied to strategy implementation, meaningfulness suggests people impacted by strategy implementation see the bigger impact that they can have, and be involved in its planning, implementation, and assessment of outcomes, particularly in terms of balancing performance targets with changes in their tasks and responsibilities.

The underlying principle from sociotechnical systems applied to strategy implementation is the importance of engaging people that are implementing strategy in a meaningful way in the processes and techniques for doing so. This would avoid the separation of leaders that make decisions to set goals and direction from the people that carry out the plans and activities to achieve those goals.

Organizational Learning

Organizational learning seeks to balance efforts for performance and achieving targets with efforts to improve the abilities to perform into the future. The notion that "the only competitive advantage the company of the future will have is its managers' abilities to learn faster than its competitors" drew much attention. Organizational learning focuses on how people learn in and about complex organizations, stressing learning as a feedback process [30, 31]. There is also a shift in this literature from learning in organizations to learning organizations [32], or what is needed to enable and support learning.

A learning organization aligns with desired results from strategy implementation, namely the notion that the organization develops its capacity to create its desired future [13]. The prevailing orientation that dominates behavior in business organizations is based on setting and achieving performance outcomes. In contrast, a learning orientation involves enabling individual learning as a basis for collective learning. There is an ability to be both adaptive (coping with change) as well as generative (creating desired futures). Importantly, facilitating generative learning requires leaders to develop skills as stewards, designers and teachers; and business teams to use managerial practice fields to learn new methods, lower learning anxiety, exercise those new skills, and support that application of what they learned in the performance fields (ordinary workplace settings). Senge proposed Personal Mastery, Team Learning, Shared Vision, Mental Models and Systems Thinking, in what he called, "disciplines," as prescriptive approaches for creating such learning organizations [33, 13].

Summary of Principles	Representative Tools and Methods
System Thinking	
Relationships: Influence of relationships among elements as well as characteristics of elements	System representation [creation and use of boundary objects/visual management]
Nested systems: System as unit of analysis and influence from one system level above and below	Process mapping
Open systems: Interchange among organization and environment	Information and material flow
Feedback: Attention to information flows	Decision points / Handoffs
Representation: Generate visual models of system	Roles / Functions
	Lean, Total Quality and Constraints methods
	Systems Modelling [system dynamics, causal loop and stock-flow-diagrams]
Social Technical Systems	
Responsible Autonomy: Involvement and responsiveness during implementation	Team and organization development
Adaptability: Emerges from autonomy in implementation	Problem solving / root cause methods
Meaningfulness of tasks: Give people role in creating changes	Goal formulation and representation
Appropriate Technology/Technique: Solution can be embraced and adapted in local context	Job redesign / best practices
	Bridging Unit [e.g. Program Management Office]
	Design Thinking
	Hackathon
	Change management
Organizational Learning	
Leader as steward, teacher and designer	Managerial Practice Fields (create context for learning)
Balance learning and performing	Dialogue
Promote individual and collective learning	Flight simulators
Generative and adaptive learning / creating desired future	Disciplines of learning organizations: Personal Mastery, Team Learning, Shared Vision, Mental Models and Systems Thinking
Teaching and learning common methods for shared understanding / learning communities	Parallel learning structures
	Communities of practice

Table 1: S Summary of ST, STS and OL Principles and Methods for Strategy-to-Implementation

Given the goals and orientation, the learning organization approaches can be applied in strategy implementation. Teaching and using learning methods would develop the people and teams tasked with strategy implementation. The learning methods create a context for generating and using feedback for reflection during implementation, and could be used to infuse a learning orientation into an organization’s strategy cycle. This introduction of learning methods, described in learning initiative case studies [34], enhances both individual and collective learning while surfacing information that provides feedback used in other activities.

In strategy implementation, this flow of information would better inform implementation plans and their adaptability, and provide feedback for future strategic decision-making.

Integrating Systems Thinking, Sociotechnical Systems and Learning Organization Approaches

Organizational learning provides approaches and practices that are vigilant in their attention to individual and group relationships that enable learning and change [33, 13]. Those that are particularly important to navigating the strategy-to-implementation gap are the development and uses of managerial practice fields to cultivate shared vision in creating desired futures. The disciplines that enable this focus on such things as dialogue, which lead to greater transparency in assumptions and reveal the ways of thinking (mental models). Understanding mental models becomes a basis for developing complementary thinking among individuals, which then aligns their behaviors across separate activities to more effectively produce desired outcomes.

Learning organization approaches, which involve creating an appropriate context while teaching and using practices that enable and promote individual and collective learning, have some common history and share some elements with systems thinking and sociotechnical systems. That commonality enables an integration of concepts, tools and methods without conceptual or pragmatic conflicts. All three approaches are oriented to teaching, learning, applying and deploying tools and methods that invest in individual and collective abilities to learn and perform better. People learn and then apply methods to collect data, conduct analysis, and gain insights with the result that creates a greater shared understanding. These activities also develop interpersonal relationships, and as people have to depend upon one another they develop greater trust. The combination of greater trust and shared understanding provides a way to guide and align independent activities toward desired collective outcomes. These are the conditions that proponents of sociotechnical systems claim for its creation of “a radical new approach to resilience.” [35, p. 129] An organizational system made up of different people from various units needs to make and sustain a constant, vigilant focus on enhancing and maintaining interpersonal relationships needed for its collective learning and performing [36, p. 38 ff.]. See Table 1 for a summary of these principles and a list of tools and methods for strategy-to-implementation.

There is a compelling case to be made, given the research finding and what we've proposed, that when the insights and principles from systems theory, sociotechnical systems and organizational learning are applied to strategy-to-implementation, the outcomes in organizations will improve. This assertion takes us to the important question of when and where to start? As discussed earlier, there is a time in the strategy cycle where creating a context conducive to learning by introducing new methods could be most easily introduced. This is the point when leaders hand off the strategic plan and its goals for others in their organization to do the planning and implementation. The opportunity at this point is to go from the handoff of a document, some associated event or presentation, to initiating a system learning process based on these

principles. In the context of the MIT SDM symposium “Characterizing the Gap,”⁷ these principles and associated methods can be used to guide both research and practice. The principles in systems theory, sociotechnical systems, and organizational learning provide a “call to action” for researchers to further test them in their studies and write about their application in their findings. However, we don’t suggest that leaders and managers wait for the new results from researchers, but instead take the evidence we provided to immediately begin to apply these principles in their strategy efforts.

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Endnotes

- ¹ Of the companies of the executive responding to the survey, 48% had revenues between \$1 and \$5 billion; 39% had revenues of \$5 to \$10 billion; and 13% had revenues greater than \$10 billion. The companies were 30% each from North America, Europe and Asia-Pacific, with the remaining 10% based in other parts of the world. The companies were from a wide range of industries, with 10% in information technology, 9% in financial services and 8% in manufacturing as the largest representations.
- ² United Technologies Corporation (UTC) created its ACE program, to which it attributed increases in gross margin, profitability and share prices. This effort was managed by a cross-functional ACE "council," which met regularly, took responsibility for the content, delivery and deployment of the associated tools, methods, training and certification of individuals and units. CEO at the time, George David, said, "it is the basis of more than half the shareholder value increase in UTC." Roth, G. "An Uncommonly Cohesive Conglomerate," *strategy + business*, Issue 72, Autumn, page 73, 2013.
- ³ "The outstanding feature of the social pattern with which the pre-mechanized equilibrium was associated is its emphasis on small group organisation at the coal face" [26, p. 7]
- ⁴ "Though his equipment was simple, his tasks were multiple," the miner "...had craft pride and artisan independence." [26, p. 6]
- ⁵ A recent example extensively covered by the popular press has been the new Tesla Model 3 production line. The efforts to achieve scale through high automation created extensive dependencies, and required scaling back and engaging the workforce. The irony in this experience was that the Tesla factory is on the site of the former NUMMI factory where, in the 1980s, the General Motors and Toyota joint venture used Toyota's "flexible automation" with adaptability to bring the Fremont to world-class quality and performance levels. See [38]

- ⁶ In mining, Trist and Bamforth found the traditional method had “the advantage of placing responsibility for the complete coal-getting task squarely on the shoulders of a single, small, face-to-face group which experiences the entire cycle of operations within the compass of its membership” giving each participant and task significance [26, p. 6].
- ⁷ MIT SDM Symposium “Characterizing the Gap between Strategy and Implementation,” April 30–May 1, 2018. See <http://www.sdm2018symposium.org/> for conference, presentations and papers; and <https://youtu.be/uCJeM523RAo> for presentation videos.

2

One size does not fit all: Addressing Uncertainty Profiles and People Impact in Strategy Work

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Introduction

Formulating and operationalizing a clear, inspiring and successful strategy is a difficult task [1]. There has been a significant increase in attention to improving strategy implementation [2], and the research reported in this chapter is part of that effort [3], [4]. A recent, Brightline-sponsored Economist Intelligence Unit Study shows that 61% of organizations struggle with bridging the gap between strategy formulation and implementation. Moreover, 53% of respondents highlighted the importance of a successful implementation and argued that ineffective strategic initiatives have a big impact on the organization's performance and competitive advantages [5].

This chapter makes a contribution to this question by a) collecting empirical data from executives and professionals in strategy functions in international companies and organizations and b) proposing a sense-making framework to present four context-sensitive categories of strategy work.

What strategy work entails differs between scholars. However, there is relative agreement that strategy implementation is not a simple set of actions, but is a complex process with many factors, such as resource allocation, human capital, communications and responsibility delegations, influencing its overall success [6]. The research presented here takes this as its fundamental hypothesis – that there is not a “one size fits all” answer to the one best way of strategy work, particularly operationalizing strategy.

Furthermore, as the only constant in business reality is change, strategy work faces a high degree of uncertainty for organizations on how to run their businesses, resulting in significant strategy risks. Dealing with uncertainty and the resulting risks is central to strategy work, because execution often does not match “plans” [7]–[10]. This led to a second hypothesis that the research reported here investigated, i.e. how the risk profile of a strategy task impacts the way that strategy work is executed.

Research Design

The research fell into three phases: 1) empirical data collection through semi-structured interviews; 2) transcription and coding of the interviews in Atlas.ti; and 3) iterative development of a descriptive framework.

This chapter is based on the interviews of 31 senior executives as well as senior strategy staff professionals with direct involvement in strategy work. The interviews were conducted between January and July 2018. The interviewees were based in 23 international companies, based in Denmark, mostly in production and engineering sectors, but also including companies from financial services and consulting. Interviews were carried out in their offices, typically the headquarters, in the greater Copenhagen area.

The interviews were based on semi-structured questionnaires that were shared with the interviewees typically 1-2 weeks ahead of the interview to allow for some preparation. Interviews typically lasted 90 minutes, but up to 2.5 hours. The interviews were recorded. The main topics addressed by the interviews were: 1) major process steps in strategy implementation; 2) examples of major risks and uncertainties; 3) examples of key decisions made; 4) examples of methods and tools being used; and 5) principles of strategy work.

Following the interviews, the recordings were transcribed and coded in Atlas.ti. Coding typically occurred in teams of two, or was checked by a second researcher, to increase coding reliability. As the interviews were semi-structured and (also) geared towards discovery, the coding scheme evolved as interviews were conducted and described.

The descriptive sensemaking framework presented in the following was the result of an iterative coding process that was carried out in parallel to the interview process. Later interviews as well as follow-up interviews were used to validate as well as fine-tune the framework.

Results

Unsurprisingly, we saw that strategy work comes in all shapes and sizes and we identified a multitude of practices.

However, four major fields of strategy work emerged: Discovery, Experimentation, Transformation and Operational Excellence, along two dimensions: degree of people impact and degree of uncertainty. (See Figure 1.)

Dimensions of framework: People impact and uncertainty

Two dimensions proved useful to group the types of strategy work: degree of people impact (this was one of the major aspects raised by practically all interview partners), as well as degree and type of uncertainty addressed (confirming our initial research hypothesis).

Dimension 1: Degree of people impact of strategy task

Typically, the primary concern of the executives was how to handle the people-related challenges of implementing strategy. This had several elements: number of people affected

(for example, does this concern a small circle of experts or a wider group of employees); scope of the impact (for example, can we reasonably expect this to be executed on top of “business as usual”, or does this require full dedication); and the “dread factor”, or degree of emotional impact (for example, are people losing their jobs, or is the impact understood and controllable).

The organizations we interviewed were experimenting with different ways of engaging people in the strategy implementation, other than, say, the usual PowerPoint presentations and newsletters. Examples included developing strategy games, role-playing, or off-site strategy boot camps using design thinking as a process driver.

ACFO illustrated this dimension nicely. While his role in the strategy process obviously involves significant quantitative analyses and review of financial performance figures with his team, he emphasized that when it comes to making strategy happen, about 80% of the work is “soft” people work. In his experience, no one paid attention to the next grand strategy initiative, or engaged actively in its implementation, if they were worried about their exact role, or maybe even job, as well as the roles and jobs of others they cared about in the organization. So understanding the emotional, people-related impact of strategy work, and actively managing how your core team and the remainder of the organization engages and resolves those people-related challenges, is core to successful strategy implementation.

Dimension 2: Degree of uncertainty the strategy task addresses

Senior executives were dealing with three major types of uncertainty: technology uncertainty (for example, technology readiness levels, or degree of performance that can be expected from a certain solution); market uncertainty (for example, reaction of the market to introduction of a new service, or choosing between various novel value propositions); and capability-related uncertainty (for example, deciding what skill set was needed to operationalize a new technology).

In our interviews, senior executives were usually focused on one or two of those three categories of uncertainty as being particularly critical. The tension between those uncertainties, particularly between technology-related uncertainty and the other two, was often described in terms of “level of innovation vs. chances and level of success”. Furthermore, in discussing those uncertainties, the executives reflected on the trade-off between putting highly formalized processes (i.e. bureaucracy) in place to create a structured process in the face of uncertainty, vs. enabling creative and independent problem solving and innovation. Those aspects, among others, are described below when we discuss the four types of strategy work.

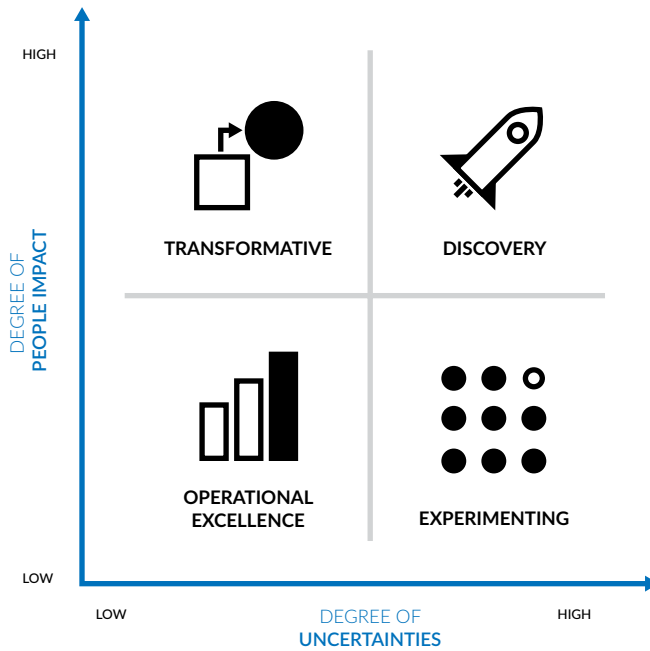


Figure 1: Four Types of Strategy Work

Four types of strategy work

Type 1: Discovery-focused strategy work

Discovery-focused strategy work was described as often having a “scary component:” executives think that there is something out there that will significantly change their business model, their product portfolio, or the way they and their organizations do their jobs. This is amplified by the large degree of uncertainty inherent in this work. For example, say, even if you think you can hire the people to make blockchain work for you, is there really a market? Is it worth doing, and if yes, for how much and how much are you prepared to lose? The discovery and evaluation of technology and market trends is strategy work. The examples most often quoted to us revolved around digitalization of core business propositions, and the possible emergence of novel, digital value propositions disrupting existing value chains (for example, by blockchain, virtual / augmented reality, or artificial intelligence expert systems).

Interview partners explicitly mentioning discovery-related strategy work were a minority. However, some companies in our study, for example a global leader actively developing and marketing novel technology solutions, have realized that it is also part of their job to support the discovery process at their clients in order to create a market for the novel IoT and AI-based products they offer. This is different from selling a finished product – it is more akin to

sharing a vision, backed up by plenty of examples. Executives in the manufacturing sector have formed a national association (MADE – the Manufacturing Academy of Denmark) to jointly drive the discovery process around advanced cyber-physical production systems. This not only reduces the cost to each company, but also systemically builds capabilities in an industry where each player depends on their up- and downstream supply chain. This results in very hands-on strategy work – from workshops for subject matter experts to executive level roundtables and show-and-tell events.

A particular challenge mentioned regarding discovery-driven strategy work is time – technology cycles, for example, can be so fast that they outrun more conservative long-range strategic planning. Executives mentioned that designing a proprietary process at their companies, one that reconciles the organizations need for stable direction with an agile capability to leverage fast-paced technology trends, was key to their success. Examples include strategy initiatives (not the entire strategy process) that did not follow the established 2-year strategy plan from concept to market, but instead embraced a design thinking-based approach where the organization experimented with minimum viable products in pilot markets quickly in order to learn quickly. (Also see next section.) Others emphasized cooperation with (or acquisition of) research and start-up companies, establishing in-house processes focused on discovering and leveraging emergent trends. However, it also included closer customer integration, as one of the key uncertainties during the discovery phase is how to establish a realistic business case for a novel idea.

Type 2: Experimentation-focused strategy work

Executing discovery-related strategy work well leads to an interesting problem: what do organizations do with ideas that are currently impossible to evaluate as a classic business case? There is still significant uncertainty regarding market demand and customers' willingness to pay, their cost and capabilities base, or whether the technology can be developed to the required needs (plus what those exact needs and requirements actually are).

The selection process leading from “discovered” options to “options organizations experiment with” often involved the use of decision-making heuristics, such as Simple Rules. For example, executives selected ideas based on rules such as: 1) if we lose all the money we invest, it must not be a problem; 2) we need to be able to at least verbalize a possible benefit scenario for current or future customers; 3) we have to be able to clearly articulate what it is that we want to learn about market, technology and/or our capabilities; and 4) we must have internal champions that are excited about doing this.

The experimentation that was reported took many forms: one company cocreated product use scenarios with possible clients in a number of workshops; groups of companies teamed up to sponsor research and proof-of-concept implementations; new processes and technologies were tried internally for 100 days in parts of the company; and companies formed internal start-ups to operationalize novel technology solutions and champion them on client projects.

Some senior executives highlighted an interesting tension here: in a traditional perception of leadership one would look to the executives for clear direction on what the future will hold. Here, instead, executives help their organization to ask the right questions.

One sentiment we frequently observed can be summarized as “learning by doing.” Senior executives acknowledged that there are areas of technology development (say, blockchain or artificial intelligence), where there is a lot of general discussion but little specific action or activity in their industry. For organizations big enough, just doing “something” (with a predefined budget) became a viable option – even if their solution did not meet all of their expectations, or even if it failed, they would have put themselves into an advantageous knowledge position relative to their competitors. The notion here is to allow the organization to learn and adapt in an uncertain environment, instead of relying on predicting the future accurately.

We will treat the remaining two types of strategy work more briefly, as we consider them already broadly acknowledged and covered in the strategy and organizational science literature.

Type 3: Transformation-focused strategy work

After targeted experimenting and prototyping sufficiently de-risked a business case, we found that executives discussed typical organizational transformation, change management and portfolio management activities as part of their strategy work. While the uncertainty is now relatively low, the scope of people affected increases again, presenting significant people-based challenges.

The success stories we documented made effective use of program and portfolio management techniques that paid particular attention to accounting for the hard and soft factors of transformation on the affected employees. We also saw examples where companies started collaboration networks around a newly developed platform concept. There are examples of organizations parallelizing experimentation and transformation activities under an Agile framework: as part of a transformation program, various implementation prototypes are run in parallel to develop specific best practices and/or technology solutions. An example of such an integrated transformation/experimentation approach was an organization that created a four-day workshop program for people affected by certain strategy initiatives. These were open-ended engagements to refine the strategic intent, identify barriers, and to develop specific implementation and transformation activities.

Type 4: Operational Excellence-focused strategy work

The final category of strategy work we observed addressed practices by executives to diffuse new technologies and efficiency practices into the organization in a less disruptive way, oriented towards enhancing day-to-day practice one step at a time. This requires that the organization had developed a thorough understanding of the capabilities and requirements of a technology field. Activities in this space that we observed targeted joint sensemaking exercises with operational management and subject matter experts to develop prioritization frameworks:

What technology for what product or market? What is our implementation roadmap? What are our criteria to prioritize activities, as well as exclude ideas? These were implemented as standard operating procedures, building step-by-step on capabilities that already existed.

Executing strategy work of the four types

An important aspect to highlight is that an organization does not “move” through these four types of strategy work as a whole – instead, they are four categories that structure the portfolio of strategy work underway in the companies we observed. Our impression was that the most successful companies had learned to execute activities in all four quadrants in parallel, and had robust processes for managing the transition of an activity from one quadrant to the other. A key question in our conversations with senior executives became the navigation flow in the quadrants (i.e. from what to what quadrant can we or should we transition a strategy activity) and the speed and timing of those transitions.

Discussion

Strategy implementation is a broad concept. There exist a multitude of perspectives and models focusing on different aspects of strategy work, their definition and description. Although heavily criticized in the strategy literature as an artificial division of two complementary activities, strategy work is regularly conceptualized, particularly in the application- and teaching-oriented literature, into strategy design and strategy implementation [11]–[13]. The design process and implementation process are presented as a sequential process [11]–[13].

Literature discussing the practice of strategy work, however, emphasizes the need for their integration. Mintzberg and Waters [7] characterized strategy work as having a fundamental tension between strategic intent and emergent strategy. A central aspect of strategy work is problem solving as tensions between strategic intent and emergent strategy are addressed. When strategies are executed they often face problems in relation to a number of aspects such as human capital allocation and resource allocation [6], [14], [15], placing problem solving as fundamental to strategy implementation and execution. The literature further argues that strategy implementation is not just a simple sequence of actions, but a complex process with many different influencing factors [6], [16], [17]. There is an argument in literature that there is an over-emphasis on strategy development over strategy implementation, compounded by the fact that strategy implementation can be seen as even more challenging and complex [1], [8].

We argue that with our empirical work, we make a contribution to reconciling the need for “strategy design” with “strategy implementation.” Based on our empirical findings, we present a sensemaking framework that accommodates both types of activities: it covers strategy design-oriented tasks during discovery and experimentation, as well as strategy implementation-oriented tasks during transformation and operations excellence. More importantly, we create a framework to concretely visualize, discuss, plan and monitor the iterative nature of strategy work discussed in the literature, by transitioning strategy initiatives through the four quadrants.

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3

Four Dimensions to Understanding Strategy and Implementation

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“

There is nothing quite so practical as a good theory ... because it advances knowledge ... guides research toward crucial questions and enlightens ... management.

”

VAN DE VEN (1989)

This article is about framing a reasoned and disciplined approach to understand the strategy and strategy implementation literature, the body of work from academia, consultants, practitioners, and writers. We are motivated to do this because their output is so vast that even a gross taxonomy can help us to more efficiently distill the knowledge that is being propagated. From the table below, it is clear that strategy is of immense interest to the general public, but that the work of a scholarly nature is dramatically smaller. Nevertheless, it is still in the millions.

search key	Google Search number of finds	Google Scholar number of finds	Ratio:
strategy	348,000,000	5,650,000	61.6
strategy implementation	12,500,000	4,620,000	2.7
strategy implementation gaps	10,200,000	2,090,000	4.9

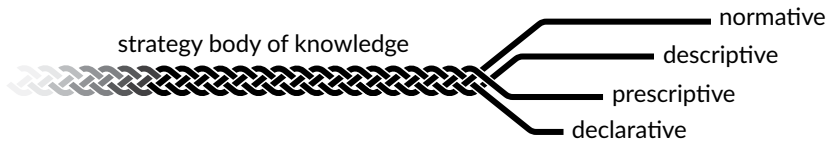
Search performed on April 2018

We need a taxonomy to accurately segregate the knowledge in this vast body of work. This approach is one adopted by scholars and practitioners in all domains of inquiry and practice. We have mechanical engineers, electrical engineers and so on. Medicine is likewise segmented into general practice, internal medicine, cardiology, etc. These distinctions are critical to research and the practice. We are motivated and driven to developing reproducible and repeatable prescriptions that will dramatically cure the disease of the strategy-to-implementation gap. We are like scientists out to cure cancer.

We identify four perspectives (or strands) in the literature and praxis. They are the:

- *normative, i.e. the research/theory perspective;*
- *descriptive, i.e. the practice-by-example perspective;*
- *prescriptive, i.e. the systematic practice by first-principles perspective; and*
- *declarative, i.e. the practice by maxims, heuristics, and proverbs perspective.*

This is metaphorically illustrated below as a rope made of four strands.



*Fluency is the most desirable emergent property of the sociotechnical system that is enacting a strategy. We call deficient enactment **dysplementation**. Our overarching goal is to attack dysplementation by understanding and learning from these four perspectives.*

Introduction

Fluency is most significant because this property indicates the absence of gaps *during* implementation. The metaphor is – we all desire a healthy strategy. Our working hypothesis is that fluency is a key *emergent property* of the sociotechnical system's behavior during the life cycle of the strategy implementation. **Fluency** is characterized by the following implementation attributes: efficacy of the strategy implementation, i.e. intended outcomes are produced; faster than planned; a minimal number of costly interruptions; usage of fewer resources than planned; and increasing the stock of useful (personal and organizational) knowledge. Overall, the sociotechnical behavior **more than satisfies**. And it contributes to the **cumulative knowledge and praxis** in the field of implementation and dysplementation. It follows that to understand dysplementation, we need to first understand the conceptual territory. The conceptual territory has been presented by scholars, consultants, practitioners, and writers. The conceptual territory can be viewed in *four perspectives*, all centered on the core issue of fluency. They are the *normative*, the *descriptive*, the *prescriptive*, and the *declarative* perspectives. By understanding the differences and first principles in the theory and praxis, we can begin to address how to eliminate gaps in the strategy-to-implementation. We can begin to understand the nuanced context that informs us of the conditions required for fluent implementations, or the lethal conditions that foment dysplementation. We will say that each perspective represents a strand in the strategy-to-implementation scholarship and practice. These four strands are summarized on the next page. Our mental model on perspectives is unique and superior to traditional approaches, which focus narrowly on the intentions and outcomes of the intellectual artifact that goes by the name of strategy. We elect to concentrate on the transformational enactments of this intangible artifact called strategy. This is analogous to the engineering design of a mechanical widget and the mass production of the widget. As scientists who are interested in the efficacy and fluency of these enactments, we seek to understand fluency as a sociotechnical behavior, their independent variables, and working mechanisms. We seek to understand the phenomenon of fluency and the mechanisms that cause its absence. This negative phenomenon – absence of fluency, its causes, and practices – we will call **dysplementation**. Our objective is to attack dysplementation.

Motivations

Strategy implementation does not occur automatically like planets that rotate around a sun. They are acts of purposeful organizational exertions, which when aligned with the superordinate goals of the organization, achieve intended outcomes of the organization to which it belongs. It follows that the implementation of strategy is not a series of random events, but deliberate group actions that are orderly and meaningful to the sociotechnical agents. Deficient order and feeble meaning generate breaches, obstacles, difficulties, and interruptions causing arduous, inefficient, and misguided implementation. They impact the fluency of strategy implementation, which emerges as dysplementation. It is our intention to wade into this implementation phenomenon and take steps towards a science of strategy implementation. Science is cumulative where meaningful ideas are further elaborated and built upon; and conversely, inconsequential ideas wither and are discarded. Our intent is to contribute to scholars and practitioners in the former scenario. We summarize our motivations using the goals and objectives canonical form:

Goals and Objectives of Strategy-Implementation Gap Theory

to	enable fluent strategy implementations, and attack dysplementation
by	understanding S/T implementation theories and practices from different perspectives
using	paradigms, principles, methods, and practice of S/T and grounded theory
subject to	rigor of normal science, S/T first principles, and grounded theory.

We note that necessarily this taxonomy has overlap. For example, a prescriptive implementation must adhere to some normative principles to demonstrate consistency, so that it is not a random case that is not repeatable. In other words, the implementation worked not by magic.

Normative Perspective of Strategy Implementation

Unlike a ball rolling downhill, or electrons rotating around an atomic nucleus, strategy implementations do not occur automatically; they are intentional acts of human will and are buttressed by operational sociotechnical systems. Therefore, we need both mental and organizational norms, rules, and standards to ensure order and meaning. This is the spirit of normative theory, axioms and first principles for how organizations should implement strategies fluently with rigor and consistency.

For example, one normative principle of S/T theory is Ashby’s Law of requisite variety [1], which states that a system can maintain homeostatic performance only if it is more complex than the complexity it faces. Clearly, if not, the implementing sociotechnical system will face a variety of

	normative	descriptive	prescriptive	declarative
perspective	research fluency of strategy implementation S/T theory and complex systems rigor and consistency	practice by specific examples documented specific cases of fluent strategy implementations	practice grounded on S/T first principles generalizable methods and processes for fluent strategy implementation	practice by maxims heuristics, proverbs dictate, inform, and intimidate the naïve, and inexperienced
key question	axioms and first principles for fluent strategy implementations	examples of fluent strategy implementations	systematic praxis grounded on science and theory fluency of a strategy implementation	quick fix, silver bullet
criteria	rigor of normal science standards social satisficing	<i>ex post</i> empirical effectiveness	empirical effectiveness case-by-case empirical principles	famous examples papers in academic journals writings of consultants
scope	broadly all strategy implementations	classes of implementations observed	classes of decisions tested and reported	executive decision situations
theoretical foundations	S/T strategy-implementation first-principles	domain specific social and technical sciences	normative and descriptive theories	Cliff's Notes of S/T research findings popular heuristics, proverbs, maxims
operational focus	implementation impedance determination of preferences	determination of useful cases emulation of role models and examples	life-cycle processes and procedures fluent implementation	emphasis on the quick fix, and silver bullets do something!!
risks and caveat	solving the wrong problem, but obeying all right principles organizational change	selecting an inappropriate exemplar limited generalization mindless mimic	completeness of prescriptions aleatory external and internal conditions cultural change	approaches that sound good, but may not be sound excessive "buy low, sell high" forced march HIPPO's*
judges	theoreticians scholars	executives and managers	applied analysts	famous scholars, executives, and consultants editors of exec. magazines and journals HIPPO's*

Table 1: Summary of four perspectives of the strategy implementation

* Highest Paid Person in the Organization (HIPPO)

Highest Prestige Publication making Observations (HIPPO)

conditions that it is unable to handle. Simply stated, in the context of strategy implementation, homeostaticity means that the sociotechnical systems responsible for implementation must be able to control and intervene during implementation so that the overall system exhibits the right behaviors to ensure its continued operations. Right behavior requires specification of goals and objectives, sociotechnical action systems and supporting infrastructures and mechanisms of right design, e.g. [2]. Ashby's Law qualifies as a first principle of fluent strategy implementations.

Another first principle originates from Bentham's concept of utility, "that property in any object, whereby it tends to produce benefit, advantage, pleasure, good, or happiness ... or ... to prevent the happening of mischief, pain, evil, or unhappiness." From this the derived strategy principle is: more utility is better than less utility. Actions that lead to diminished utility are not useful. This principle forms one of the four von Neumann Morgenstern axioms, which underpin the entire field of decision theory. Another principle [3] is: great success is possible, even in hostile environments. For example, many investors consider market volatility as inhospitable to active participation in the stock market. However, hedge fund investors prefer volatility and the VIX to the other traditional indices of Dow Jones, SP500, and such. Volatility as an indicator of uncertainty; it follows that uncertainty is not all bad. Principles, which consider uncertainty as the enemy, are not always correct. The principles to meaningful and successful strategies are voluminous. We do not follow the crowd. We choose to concentrate on principles that cause and drive strategies to disappoint, dysfunctional strategies that exhibit strategy-to-implementation gaps. We focus on dysplementation.

Strategy implementations are intentional acts of human will. Intention means that the sociotechnical actions are directed to the achievements of desired outcomes. It follows that another key principle is having the right goals and objectives. Sloppy goals and objectives are the start of strategy dysplementation [4]. The necessities for control and interventions during implementation, and to maintain homeostaticity e.g. [5], do not take place at predictable times. We need sociotechnical system design principles to know when and how to intervene so that implementation is fluent. Regrettably, the mental model for control and regulation is dominated by the dumb thermostat metaphor. These are *ex post* mechanisms, applied after the damage is done and costly to fix. For example, solving the *wrong* problem spectacularly well will necessarily result in harmful and unintended consequences. Such *ex post* exemplars of strategies and implementations are untimely. Homeostaticity requires *ex inter* interventions and regulations for satisficing performance. Therefore, having the right goals and objectives combined with appropriately designed systems are fundamental characteristics of sociotechnical systems that can satisfice fluent implementation. *Ex ante* and *ex inter* mechanisms are more useful, meaningful, and efficient.

We sketched two normative principles necessary for fluent implementations. One is Ashby's Law of Requisite Variety [1]. Requisite Variety with homeostatic performance enhances implementation fluency. In a previous article [4], we argued three principles of goals and objectives. They are: the principle of excluded reductionism, the principle of hereditary propagation, and the synthesis principle. Our goals are to specify a parsimonious and near-orthogonal set of principles for the fluent implementation of strategy.

Descriptive Perspective of Strategy Implementation

The descriptive school concentrates on presenting successful cases of fluent strategy implementations, from which useful lessons and practices can be inferred and practiced. The focus is to uncover and present case-specific mental models, conditions, variables, constructs and empirical evidence that can explain the reasons for the fluent implementation of the presented case. The motivation is to describe fluent implementations of strategy and discuss lessons learned from current practice. These cases demonstrate that implementation gaps are not a universal phenomenon; that fluent implementations are possible even under diverse conditions; that interpretations of normative principles apply; and that useful lessons can be inferred. Thus, the cases presented are frequently used as exemplars or metaphors for emulation. The described cases are generally thematically specific, with tight boundaries within concrete domain disciplines.

Six Sigma is an example. Six Sigma's strategic objectives are to reduce defects in business processes to less than 3.4 per million opportunities. The goals for this objective vary by the company that implements this strategy. For Motorola, the creator of this strategy, its goal was survival of the firm; for GE, it was to elevate its competitiveness and industry standing, e.g. [6]. Six Sigma has now extended to sales, billing, purchasing, services, and so on [7]. Decades of practice has distilled principles and factors for effective and efficient implementations e.g. [8], [9], [10] for fluent Six Sigma implementation. These factors and principles, though different, have considerable overlap, such as: upper management support and participation, training, tools, human resources actions, cultural factors, and so on. The wide variety of Six Sigma implementations, in a variety of functional domains, makes it descriptive. Apparent *absence* of a near-orthogonal parsimonious set of principles prevents Six Sigma from becoming a unified prescriptive strand in the strategy to implementation domain. We summarize Six Sigma as follows:

Six Sigma Goals and Objectives

to	Improve customer satisfaction and business performance.
by	Reducing errors to 6.4 instances per one million opportunities.
using	The DMAIC Methodology of Define, Measure, Analyze, Improve, and Control.
subject to	Systematic exercise of statistical methods in key sociotechnical subsystems and processes.

This example is focused on the theme of Six Sigma strategy implementation. However, the range of descriptive implementation cases is very broad indeed, e.g. CRM e.g. [11], multinational e.g. [12], B2B e-procurement e.g. [13], IT-based virtual organizations e.g. [14] and so on.

Prescriptive Perspective of Strategy Implementation

Unlike the *descriptive strand* that presents *specific instances* of fluent strategy implementation

examples, with lessons learned and distilled case-specific success factors as principles, the prescriptive strand organizes a body of detailed processes and methods into a framework to achieve *specific outcomes*. The prescribed processes and methods are designed to be followed systematically. This systematic approach is grounded on specified social, technical and discipline-specific principles, which have been observed and rigorously demonstrated by scholars and practitioners to be effective for strategy implementation.

A good example is Lean Thinking e.g. [15], [16] the core principle of which is to eliminate waste by only engaging in *activities* that *add value*. “Value is product specific, and the authors argue it is only meaningful when expressed in terms of a specific product”[17]. *Value* is widely assumed to be understood by everyone and is generally left to the reader to interpret its meaning and applicability under a variety of situations. Lean Thinking, however, defines value as an articulated set of benefits that customers consider important [18]. And activities are characterized into three kinds – those that add value, those that are necessary but provide no value but are unavoidable, and those that add no value and should be eliminated. Activities are defined by specific practices. Activities and practices are integrated in a sociotechnical system, structured using a “Transition-to-Lean Roadmap”. The roadmap is comprised of three cycles: Entry/Reentry Cycle, Long-Term Cycle, and the Short- Term Cycle. Examples of activities are: obtain senior management buy-in, map value stream, monitor Lean progress, and so on (op cit. 155). And to monitor progress into the journey, there is an assessment and calibration instrument known as LESAT [19]. Notably, Lean Thinking anchors its Lean strategy with a set of principles, from which a consistent set of activities and practices prescribe how to implement strategy fluently. We summarize Lean as follows:

LEAN Goals and Objectives

to	changing sectors in the defense industry.
by	by eliminating waste and adding customer value.
using	lean activities, practices, and Transition-to-Lean Roadmap.
subject to	Lean six principles and ... ethical business and management sociotechnical practices.

This example is focused on the Lean strategy implementation. There are many other prescriptive strategies, e.g. Keeney’s Value-Focused Thinking [20], which prescribes how to make creative decisions, and Porter’s Five Forces approach to strategy and implementation [21].

Declarative School of Strategy Implementation

It is unlikely that a large majority of executives, or their direct reports, or staffs, or people in general, regularly read the research literature to ruminate about theory. A great deal of theory, knowledge, methods and practices is propagated by the trade press, articles in prestigious

newspapers, consultants, celebrity executives, and word of mouth. The publications from well-known management schools are a very popular source of declarative strategies, practices, heuristics, and folk wisdom. The mechanism is by exposition and declaration of summaries, repackaging, personal and secondhand experiences. The content is presented in small, readily and easily digested dosages. The range and depth of erudition and scholastic rigor varies widely. It must be said that as a rule the authors greatly simplify and over generalize the technical rigor and domain knowledge that is communicated. However, participants in this strand have a noble desire to popularize and propagate methods and tools.

Another frequently used approach is called by command or directive, and is often adopted by HIPPOs. HIPPO is an acronym for Highest Paid Person in the Organization. HIPPO has a negative aura. People tend to think of a HIPPO as a kind of ill-informed, boorish autocrat. The Boss (TB) in Dilbert is an example of such a person. While we have all worked under such people at one time or another during our career, their negative image is well deserved. But there is another species of positive HIPPO.

HIPPOs are also inspired leaders of important companies, and organizations are frequently exemplars of brilliant strategists that have led very important successful implementations; such as FDR strategy for victory [4], Jack Welch's strategy for GE, Tom Watson's strategy and transformation of IBM into a computer company.

It is for us to judge which class of HIPPO we are engaging. This subject is outside the scope of this article.

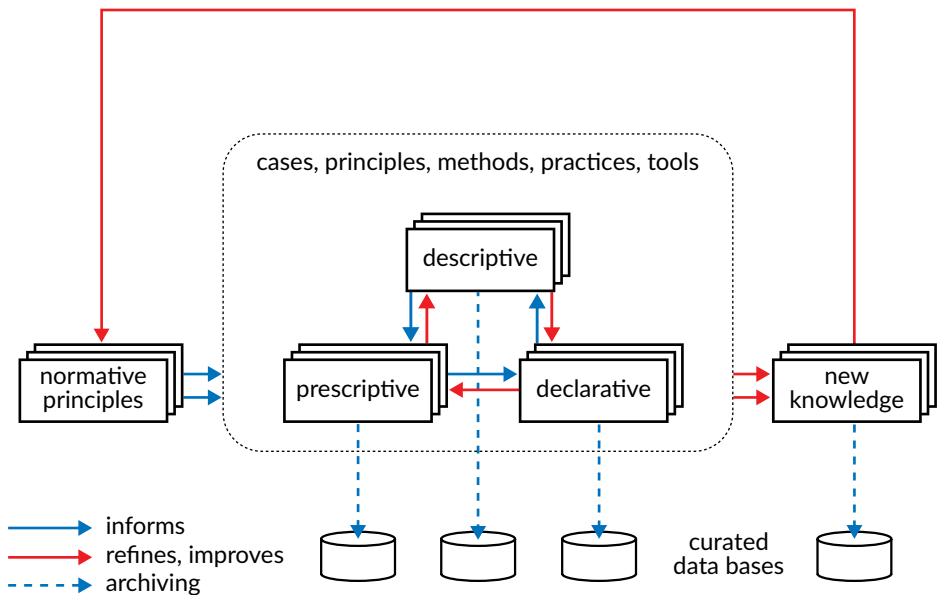
Discussion

Clearly there is overlap among the four strands. This should not be surprising. That principles should be perfectly orthogonal is a very difficult standard for sociotechnical systems and their management. For example, it is impossible to claim that a strategy is effective and efficient without stating normative rules; such as, "this strategy recipe produces the best outcomes among the considered alternatives." Implicit in this evaluation is that outcomes can be ranked and ordered to demonstrate that a strategy's outputs consistently out-rank competing alternatives. The principle is that alternatives that outrank other alternatives are superior. We have already discussed this issue in the Descriptive Perspective of Strategy Implementation and will not repeat it here. The concept of the distinct research streams and strands is not new, but follows in the footsteps of previous scholars in other sociotechnical domains, e.g. [22].

We propose the following action plan:

(1) Curate collection of strategy implementation cases. The schematic below sketches a process for this activity. The idea is to organize significant strategy cases by research strand. This will be very helpful to researchers and practitioners.

(2) Specify appropriate goals and objectives to attack dysplementation. We take inspiration on how to attack dysplementation from four sources. First is from my naïve and limited understanding of medicine but which, nevertheless, made me think about dysplementation. One way to promote health is to study and identify all the conditions and reasons that make people healthy. The other is to understand the diseases that make people *unhealthy*, and attack these diseases. Hence, we have medications like aspirin, penicillin, insulin and so on. Second is from the marketing literature on customer satisfaction [23]. That approach turns its attention on the reasons there is *no* customer satisfaction, and attacks these pathogenic reasons. The result is the famous diagnostic gap model, which has over six million Google mentions. Third is the Pugh engineering approach, which identifies the weaknesses in a product design [24]. Pugh specifies a very detailed method he called “attack the negatives” to make the product competitive. Fourth is Lean Thinking [18], [19]. The central idea is waste, what it is, and its systematic elimination supported by rigorously reasoned arguments. Hence it occurs to us that directing our attention to the *diseases* of dysplementation and attacking them is a meaningful strategy. Adopt the analogous concepts of *diseases* in health. *Gaps* of customer satisfaction, *weaknesses* in product design, and *waste* in Lean, we will call impedances to **fluent** strategy implementation. Anything that prevents fluent implementation is an impedance. Therefore, attack impedances. We summarize our goals to articulate and discuss the concept of impedance and dysplementation as follows:



Goals and Objectives – Attack dysplementation

to	make significant improvements in the fluency of strategy implementations	
by	attacking impedances in strategy implementation	
using	S/T theory, complex systems, methods, and tools	
subject to	research rule:	Must have published supporting literature.
	accretion rule:	Must add to the science and praxis.
	science rule:	Must be consistent with normal science, S/T science, complex system, and sciences of the artificial.
	actionability rule:	Must be actionable by organizations.

Summary

To understand the abyss between strategy and implementation, we proposed three perspectives (or strands) in the literature and praxis. In addition to the canonical form for goals and objective [4], we proposed the research/theory perspective; the practice by example perspective; the systematic practice by First Principles perspective; and declarative practice by maxims, heuristics, and proverbs perspective. We call them simply the *normative*, the *descriptive*, the *prescriptive*, and the *declarative*. We specify **fluency** as the most desirable emergent property of the sociotechnical system that is enacting the intellectual artifact we call strategy. We call deficient strategy enactment **dysplementation**. Our overarching goal is to attack *dysplementation* by understanding and learning from these perspectives.

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The Discourse

BRYAN R. MOSER

Academic Director, MIT System Design & Management
Massachusetts Institute of Technology

Over the course of two days at the 2018 *Characterizing the Gap between Strategy and Implementation* Symposium, much time was spent in dialogue: dynamic questioning of speakers, panel discussions, coffee breaks, posters sessions, dinners and workshops.

Ricardo Vargas, the Executive Director of the Brightline initiative, kicked off the symposium by challenging researchers and practitioners how one might better transform strategic intent into results. Why does this happen so rarely for our most important challenges? He asked the audience to use their “beautiful minds to help us to understand through research and in a practical way” the gap and to overcome it for the benefit of society. “Work together to cause this positive change.”

Keynotes

HAL GREGERSEN

Executive Director, MIT Leadership Center

Professor Gregersen delivered the first keynote, “The surprising power of questions.” For decades Gregersen has studied leaders as they face globalization, transformation, and more recently innovation challenges. Hal reminded us that leaders (and strategy) can become isolated, leading to a “dangerous disconnect” between the leader and their organization. He described his experience with top performing leaders who are able to figure out *what they don't know they don't know*. The essence of this capability, he argues, is not simply having more data, but rather seeking and questioning. Despite the trappings of power, inundation of active data, and difficulties in crossing the boundaries surrounding the C suite, effective leaders are able to (non-stop) pay attention to various passive data and ask deeply meaningful questions. These skills burst the bubble of isolation that leaders face by finding the right questions. Gregersen reminded us of Drucker's assertion more than 50 years ago: “The important and difficult job is never to find the right answer, it is to find the right question.” Across several real-world examples, Gregersen described leaders who every day put themselves in a position not to confirm their existing hypotheses and strategies, but rather to uncover about that which they are wrong. To disconfirm. In this environment of being wrong regularly, leaders become comfortable, if not relentless, at working backwards to shape strategy in concert with implementation realities.

DAVA NEWMAN

Apollo Professor of Astronautics and Engineering Systems,
recent former Deputy Administrator of NASA

Professor Newman, who has just returned from NASA to MIT after acting as the Deputy Administrator at NASA (number two – or “number one” if you are a Star Trek fan) – reflected on innovation capabilities as a bridge between strategy and implementation. She is an expert in human space flight including the bioengineering and the design of advanced space suits. She passionately argued for a systematic framework of diversity, creativity, and inspiration to develop and deploy innovation across a complex organization such as NASA. She shared with the audience the strategic questions which drive NASA. Are we alone? Are there habitable planets? Is there life? She described the portfolio of missions at NASA that respond to these fundamental questions with a need for remarkable effort and innovation. After all, by their nature these missions are complex and uncertain.

At NASA Prof. Newman asked “How can we empower innovation” “for example” an idea portal to channel ideas not simply a thousand flowers blooming, but ways to bubble up new ideas with a framework; for example an idea portal to channel ideas from across the agency. An innovation framework was introduced including continuous, disruptive, transformative, and revolutionary capabilities for NASA as an organization. *Continuous* innovation challenges everyone to improve existing technology and organization every day. A *Disruptive* approach is a focus on new organization models to accomplish mission with existing technologies. *Revolutionary* innovation in comparison is an emphasis on new technology, examines what new technologies and technical competencies can accelerate the achievement of NASA's missions. Prof. Newman then described the most significant – and perhaps most difficult – innovation capability as *transformative* – in which both new organization and new technology are introduced in concert. Prof. Newman then concluded her talk with a set of practices used at NASA to build these innovation capabilities.

JOHN DYSON

Director, The Dyson Project and recent Head of Global Capital Strategy & Head of Global Project Management, GlaxoSmithKline (GSK)

John Dyson shared his journey with GlaxoSmithKline (GSK) to realize company strategy through capital construction projects. Even though his teams began with a focus on production and other capital projects, they learned many lessons to improve strategic design of implementation options for non-capital projects as well.

At the heart of Dyson's approach is ensuring creativity in the early stage, often not thought as a regular element of construction planning, and as such to take the collaborative process during this front-end discussion very seriously. John reminded us of the natural tendency of business to become stubborn in views given experience, and thus a need to stimulate challenges to established views to create an environment in which participants question the well accepted assumptions – often unstated. To promote iterative and collaborative planning of global strategy and implementation, many habits are to be overcome. “Engineers love to draw straight lines”, yet proceeding from strategy to implementation projects is not a straight line.

Interestingly the timeliness and budget performance (often emphasized in the projects world) were less a concern for his teams. Rather achievement – or not – of the strategic mission of the firm stood out. John introduced an approach called “Chip Thinking” – which was awarded the Queen's Award for Innovation in the UK. The approach promotes awareness of the full value chain decomposed into elements that can be modeled and simulated separately, then combined again to allow for dynamic forecasts of alternatives when changing the full production ecosystem in context. This apparent simplification by giving a simple, common language about elements of the complex system – *a chip* – became an easily adopted way for the wide range of stakeholders to participate in early “strategy to implementation” dialogue. A common pattern of use was conversation about strategy – and to then play with options for implementation.

While these abstract models are a form of fantasy, they are also “semi-real”. John showed a compelling visualization which was used for real time dialogue on design as a collaborative game: “Factory in a Box”. Given how quickly the team of teams explored and generated major alternatives, he reported that for some factories they developed 35 significant scenarios. He reported the use of these interactive, visual platforms to drive divergent thinking; “get people to think wildly”. Even those ideas that may seem wild early on may be the seeds of later (and viable) generated alternatives.

4

An SVN model-based approach to assessing the gap between strategy and implementation: The case of Kashiwa-no-ha Smart City

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Abstract

Smart cities are increasing in popularity as the application of smart technologies can increase efficiency and provide data useful for decision-making. However, studies show that the needs of people must be understood to ensure successful application of such technologies, which calls for a need to include social aspects of smart cities. In response, broader concepts of a “smart city” have been proposed, which include heightened environmental and social awareness for sustainable development. The present chapter aims to ensure successful implementation of technologies in smart cities by improving stakeholder collaborations. Kashiwa-no-ha Smart City (Japan), was selected as a case study because of its design under a public-private-academic partnership and emerging concerns regarding the adoption of technology. Surveys were conducted to analyze existing collaborations and a Stakeholder Value Network was developed to identify relationships between stakeholders. Based on the understanding of the value flows between stakeholders, a proposal was developed for improvement. Results showed a lack of feedback loops from beneficiaries to decision makers resulting in poor adoption rates of smart technology (e.g. shared electrical vehicles). In recent years, transdisciplinary approaches, which empower service users to be involved in decision-making processes, have been presented as a means to avoid such problems. Therefore, the utilization of a transdisciplinary approach to improve feedback processes from beneficiaries (residents, businesses, and incubators) to service providers (public-private-academic partnership) is proposed. All in all, this improvement in the SVN has the potential to ensure better implementation of the city's strategy.

Keywords: stakeholder value network; stakeholder education; smart city; transdisciplinary science



...the application of smart technologies can increase efficiency and provide data useful for decision-making.



Introduction

The majority of the world's population lives in cities and these cities are developed to maximize services for the people. To improve the provisioning of services in complex environments, decision makers are turning to smart technologies. Smart cities around the world have shown potential to be more energy efficient and reduce transport-related issues; however, the governance of smart cities is still developing and literature shows a strong focus on technological advancements in cities [1]. Although the application of smart technology is a fundamental property of a smart city, there is an increased awareness that smart cities need to be discussed holistically [2]. This includes discussions about “smart” citizens [3], which makes the issues more complex and sociotechnical. By analyzing issues as sociotechnical, computing technologies can be developed specifically for living activities [4], rather than focusing on technological advancements alone [5], as has been the case in many smart city projects.

Although there is no apparent definition of smart cities at present, the concept of all smart cities includes the use of electronic technology and network implementation [6], and infrastructure construction integrated with these technologies [7] to reduce the operating costs of cities [8], stimulate economic growth [9], and maintain the safety and efficiency of the urban system [10]. Increasingly the success of a city depends not only on hard infrastructure, but also on the availability and quality of knowledge communication and social infrastructure [11]. Emphasis on “smart city” in concept and practice underscores the use of information and communication technologies (ICT) to provide these services. However, “smart” can mean different things in different contexts [12]. Smart cities in Japan have already shown an increased collaboration among stakeholders and a focus on culture, science [13], transportation, the reduction of energy use [14-15], and even health and wellbeing [16].

Japan is one country where the number of smart cities is growing. The Japanese government aims to obtain “a high degree of convergence between cyberspace (virtual space) and physical space (real space)” through the use of sensors, a focus on big data, and artificial intelligence, also known as “Society 5.0” [17]. To achieve this aim, a systems approach can be useful to better understand the complex linkages between the needs of society and the possibilities of smart technologies [18]. In addition to the complex sociotechnical environment, the needs of individual stakeholders are often dispersed and difficult to understand with conventional ways of thinking in urban planning [19]. Therefore, collaboration and understanding among stakeholders is needed. As part of this approach, the values of stakeholders in a project are systematically analyzed and the technology is focused based on their needs. This chapter will give an example of utilizing a systems approach in urban planning to ensure better implementation of the strategy at hand.

Methodology

Research design

This chapter aims to frame newly emerging sociotechnical problems in Kashiwa-no-ha to improve the services from and for the stakeholders identified during a previous stage of this research. Given the emergence of these problems, the analysis aims to understand areas requiring improvement in the implementation of the smart city strategy and uncover ways to address these gaps. To reach this aim, two steps are developed as follows: 1) Stakeholder Value Network (SVN) analysis is conducted to identify areas of ineffective strategy implementation, and 2) based on the previous step, suggestions are made to solve this problem.

Introduction

This research was developed based on the results of a Global Field Exercise (GFE) at the Graduate Program in Sustainability Science – Global Leadership Initiative (GPSS-GLI), part of the Graduate School of Frontier Sciences (GSFS), The University of Tokyo. GFEs are field-oriented exercises organized in a variety of study areas, implemented by GPSS-GLI to offer students the opportunity to develop fieldwork competencies involving group work and stakeholders [20]. The GFE upon which the results presented within this chapter are based, focused on finding solutions to newly emerging problems in Kashiwa-no-ha Smart City. A site visit was held on October 31, 2017, and stakeholder meetings between November 2017 and December 2017 with the city government, UDCK (Urban Design Centre Kashiwa-no-ha), and the developers. To ensure a better understanding of the complexity of the case, five teams of 5-6 students identified newly emerging sociotechnical problems in the case study in collaboration with the abovementioned stakeholders. The problems were categorized according to social importance and linkages with the smart city strategy within their corresponding problem space [21]. The problems identified were: 1) unresilient energy supply from traditional sources (e.g. fossil fuel based), 2) lack of cultural identity, 3) difficulties in creating an enterprise mix for economic resilience, 4) lack of quality of life of international residents, and 5) population decline and lack of inbound migration.

Given the wide range of problems identified by the teams, data was collected from a number of different sources. A literature review was completed by each team to provide context for smart city projects and the sociotechnical problems identified. Secondary data was documented to set out background for the case study area with existing data. Questionnaire surveys (4), stakeholder interviews (8), and a focus group discussion (1) were conducted by the different teams to gain an understanding of stakeholder viewpoints and relationships. Questionnaire surveys (A) and (B) targeted 50 startup members of two local business incubators, with four responses for each. Questionnaire survey (C) targeted 280 residents and received 54 responses. Questionnaire survey (D) targeted the international students of The University of Tokyo Kashiwa Campus in two rounds, with 55 and 40 responses respectively. Stakeholder interviews were made with representatives of city government (1), the developers (1), residents (1), business (4)

and academia (1). The focus group discussion was conducted with three older residents. Having collected data within separate teams, the underlying cause of the sociotechnical problems was then examined in the next step collaboratively.

Stakeholder Value Network

An SVN can be used to understand the impacts of relationships between project stakeholders and ensure successful implementation of a project [22]. The relationships between stakeholders and the services they provide were documented in an SVN allowing for the formulation of value flows [23]. This was done to reveal the underlying cause of the emerging sociotechnical problems. The data was obtained in the previous step of the research by the individual teams. Collaboration amongst the groups was facilitated by one coordinator and a representative of each team to combine the data they had derived. The primary roles of service participants were clustered and characterized as distinct stakeholders within the value flow network. Stakeholders are connected through creation and consumption of value categorized as 1) services, 2) business services, 3) policy, and 4) finance. Based on this, weaknesses in the SVN could be identified for a better understanding of the efficacy of the smart city strategy and the potential for improvement in the implementation of it.

Case study: Kashiwa-no-ha, Japan

Kashiwa-no-ha is a smart city located in Chiba Prefecture, Japan, with a population of 11,552 [24]. The city is planned to become an environmental-symbiotic city of new industry creation, health, and longevity. To achieve this goal, it utilizes extensive stakeholder collaboration with public-private-academic partners, which is given physical form by UDCK (Urban Design Centre Kashiwa-no-ha).

UDCK has implemented different types of activities in response to the diverse needs of stakeholders and multiple goals of the city: 1) research collaboration between universities, businesses, and residents; 2) connecting technology to residents' lives; 3) collaborative management of urban spaces; and 4) provision of community activity opportunities. However, despite the establishment of UDCK as a cornerstone of the smart city strategy for stakeholder engagement and planning coordination, newly emerging sociotechnical problems counter to the project's goals can be found.

These problems are diverse. Some are problems many cities are facing (such as Japan's rapidly shrinking and aging society), and some are more unique to the specific situation of Kashiwa-no-ha (such as a lack of cultural identity within the newly developed area). These problems have a high level of complexity, with many different stakeholder involvements. In order to understand and solve these individual problems, an in-depth understanding of stakeholder relationships is required. To achieve this, the creation of a SVN to model the stakeholder associations is useful. The use of systems thinking in urban planning has been successfully used for this purpose in previous studies [25-27].

Results

Results of SVN analysis

The identified sociotechnical problems were described in relation to their corresponding stakeholders (Table 1).

No.	Stakeholder	Category	Description
1	UDCK	Service provider	Public-private-academic partnership between stakeholders 2-4 (Kashiwa city government, The University of Tokyo, and Mitsui Fudosan)
2	Government	Service provider	Including stakeholder sub-groups: local (Kashiwa city), prefectural (Chiba prefecture), and national (Japan)
3	Academia	Service provider	i.e. local universities and their members (including The University of Tokyo, Chiba University, etc.)
4	Developers	Service provider	i.e. Mitsui Fudosan, a private real estate development company
5	Incubators	Service provider	i.e. KOIL (a startup incubator affiliated with private real estate developer), Todai Kashiwa Venture Plaza (an academic startup incubator affiliated with The University of Tokyo), and Tokatsu Techno Plaza (a business incubator affiliated with Kashiwa City and the University of Tokyo)
6	Residents	Beneficiary	Including stakeholder sub-groups: older residents and international residents
7	Visitors	Beneficiary	N/A
8	Business	Beneficiary	Including stakeholder sub-groups: entrepreneurs, startups, companies, and employees

Table 1. Summary of stakeholder groups of Kashiwa-no-ha Smart City identified as part of SVN analysis.

UDCK: This was the first implementation entity built under the UDC Initiative (Urban Design Center Initiative) framework [28] in Kashiwa-no-ha Smart City. It provides a platform for the public-private-academic partnership to implement strategy in Kashiwa-no-ha Smart City [29].

Government: The role of the local government in the development is primarily to provide public services such as daily services (e.g. sanitation, energy, infrastructure, and policy) through regulation of other stakeholders. The role this stakeholder plays differs among smart cities. In Japan, due to severe financial constraints in all levels of government, the development strategy of Kashiwa-no-ha Smart City relies more on collaboration with academia and private developers.

Under the coordination of UDCK, the local government has been able to implement new initiatives with financial resources from the private sector. For example, the use of tax money in the development of a centrally located stormwater retention pond was not allowed. Public access to the area was limited, and it was an unattractive area in a central location. While technical function of the retention pond had to be guaranteed, local government gave permission for the area to be redesigned as a public park [30].

Academia: Academic institutions play a very important role in the case study. A large number of employees and students of the universities rely on services provided by other stakeholders, and academic institutions provide services in the smart city, many of which are coordinated by UDCK. The University of Tokyo facilitates an Urban Design Studio course. In the studio, students design the future of Kashiwa-no-ha. Some proposals are implemented or inspire existing projects. While the University of Tokyo has placed a lot of effort into the creation of such experiments, initiatives have often been implemented for the duration of the funding period, disappearing soon after. For example, Intelligent Transportation Systems (which included bicycle and car sharing) were put into effect in 2007, but were later discontinued [31].

Developers: Mitsui Fudosan has been the main developer in the area because of its land ownership. While primarily providing infrastructure, the developer has also made other contributions (e.g. living services). After the Great East Japan Earthquake, Mitsui Fudosan implemented a city-scale “Disaster Ready Energy System” to ensure the continued provision of electricity to public areas in emergencies in order to ensure the continuation of basic services and prevent threats to life and economic losses. However, despite the implementation of smart grid technology, the energy system remains heavily reliant on traditional fossil fuel sources.

Incubators: In order to achieve the aim of a diverse mix of enterprise models, a number of start-up incubators are in operation in Kashiwa-no-ha. The developer has opened Kashiwa-no-ha Open Innovation Lab (KOIL) as an incubator offering infrastructure and business support to 38 local start-ups and 230 individual entrepreneurs. The University of Tokyo (with the support of local government and other local universities such as Chiba University) provides a platform for start-ups to be developed from research initiatives and for established businesses to obtain research and development services through incubators (Todai Kashiwa Venture Plaza and Tokatsu Techno Plaza have 17 start-up and 34 start-up and SME members, respectively).

Residents: Residents are the main recipients of various services in smart cities. In Kashiwa-no-ha Smart City, many residents also participate in a number of UDCK and academia-implemented experiments, such as the abovementioned bike and car sharing schemes. There is a rare opportunity for such experiments within Kashiwa-no-ha as the residents have characteristics that differentiate them from residents of other areas: high internationalization, wide range of age groups, and many have relocated after (and especially for) the establishment of the smart city.

Visitors: Payments by visitors for services and taxes generated from purchases are important income sources for Kashiwa-no-ha Smart City. In fact, attracting tourists is one of the development strategies of the smart city. From the perspective of systems thinking, visitors are external elements of the smart city system, however, they are the best evidence of the attractiveness of Kashiwa-no-ha – frequent visits bring vitality to the economy. Additionally, visitors have potential to be attracted to and become permanent residents of the smart city.

Business: Businesses provide many services within the smart city, contributing to economic robustness and generating employment in the area. Attracting a diverse mix of enterprise models and industry types to the city is part of the strategy of Kashiwa-no-ha Smart City, but this is an ongoing goal. To attract businesses, stakeholders provide services marketed to businesses. The key pulls are: 1) proximity to academia (for research and development services); 2) the ability to test innovations with the population who have an interest in smart city concepts and inventive ideas; and 3) infrastructure (especially in the form of business incubators).

Based on stakeholder interviews and collaboration of representatives from each of the five teams, the SVN was created (Fig. 1). It was found that some stakeholders were overrepresented, while others exerted little influence in the determination of value flows. UDCK has, despite its presence as a platform for public-private-academic partnership, limited promotion and lack of accessibility to other stakeholders, especially residents. However, residents are intended to be the main beneficiaries of the collaboration. Consequently, this has led to the underutilization of UDCK's potential. At present, the smart city value is not fully reflected as some sociotechnical issues uncovered in this research have not yet been considered by the stakeholders (e.g. population decline and a lack of cultural identity).

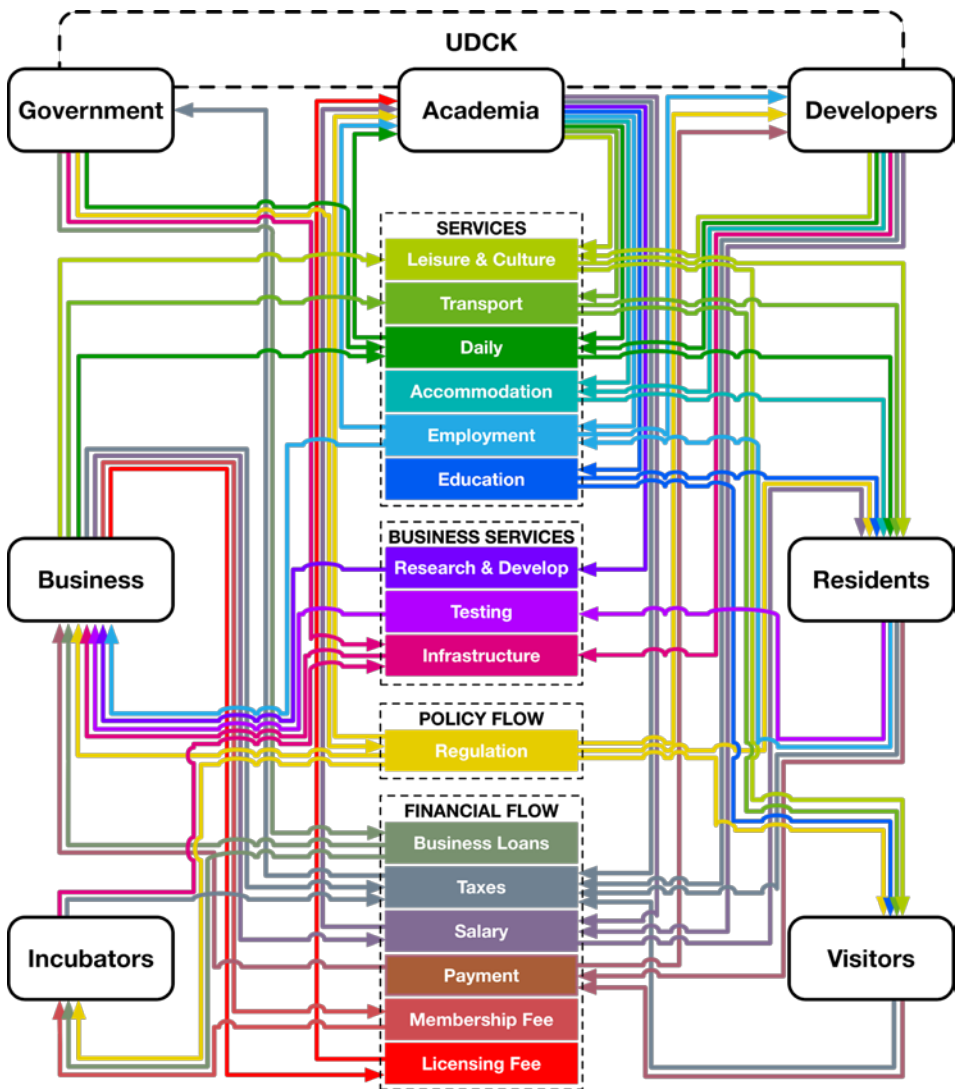


Figure 1: Comprehensive SVN for stakeholders of the Kashiwa-no-ha Smart City.

Recent literature describes transdisciplinary approaches in which projects are codesigned with stakeholders, especially beneficiaries, to avoid top-down decision-making [32]. This approach serves to bridge both aspects of sociotechnical problems by integrating society's needs [33]. This decision-making power is represented in the regulation flow of the SVN (Fig. 2). The current situation leads to a lack of interpretation of the beneficiaries' needs as depicted by the solid lines.

In the Kashiwa-no-ha Smart City system, the public-private-academic partners work together under the coordination of UDCK. This includes complex policy implementation processes with many stakeholders and beneficiaries involved. Currently, residents feel that strategy in Kashiwa-no-ha is implemented without consideration of their voices.

Considering this, the SVN was modified to empower residents, local businesses, and incubators to be involved in the decisions of UDCK, with regulation value flowing from these stakeholders to government (Fig. 2). With these feedback loops, residents, business, and incubators can influence UDCK, which can in turn provide better services.

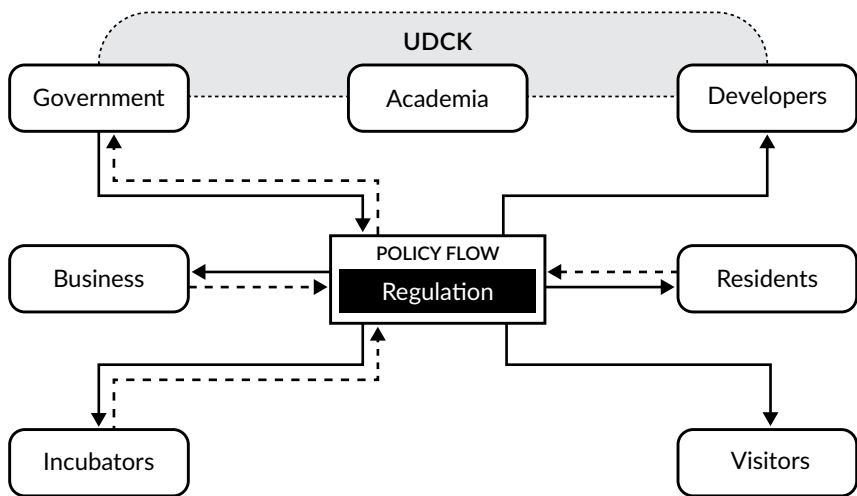


Figure 2: SVN of Kashiwa-no-ha Smart City (Solid lines: regulation value flows. Dashed lines: proposed value flows to strengthen stakeholder relationships and improve implementation of the smart city strategy).

This concept can be realized by involving stakeholders in decision-making. For instance, as the smart city strategy involves attracting a wide range of enterprise models, by including business stakeholders in strategy decisions, the likelihood of strategy success increased. For example, business has stated that a lack of venture capital in Kashiwa-no-ha is the reason that start-up business in certain sectors has not seen success in the area. By considering these kinds of viewpoints, the development team can focus their strategy to tackle these issues.

There is a clear difference between the improved model and the original model, which is reflected in the change of regulation value flows. For practical needs voiced by business, residents, and incubators, the government can respond, provide solutions, and better implement strategies through UDCK.

Discussion

Previous studies suggest that a transdisciplinary approach can solve problems traditionally found in governance with a top-down approach. If sustainability is the goal, collaborative governance systems are required to tackle complex problems [34]. One such system is the “living lab”, a cocreation concept where users in a real-life environment drive innovation, encompassing social and technical dimensions simultaneously in a business-citizen-government-academia partnership. An example of a living lab is Botnia Living Lab, an area for development of IT services and products where users are involved as equal cocreators along with the other stakeholders (companies, academia, and authorities) [35]. Openness, realism, and empowerment are key concepts of the living lab. This is particularly useful to the present case, where stakeholder engagement is a goal that has not been fully realized.

In the living lab, users are enabled to create value. Likelihood of project success is increased, as beneficiaries are included and able to communicate their needs throughout the development process [36]. Smart city need not be understood as a top-down approach, but as a living “system of systems”, consisting of many stakeholders and values that work together [37]. To promote innovation, a stated goal of the Kashiwa-no-ha Smart City project, stakeholders need to be enabled by the development team (through UDCK) to generate and share ideas.

To strengthen the relationship between stakeholders, a bottom-up decision-making approach is proposed with feedback flows. These feedback flows enable improved information flow between stakeholders providing feedback regarding both suitability of strategy to address stakeholder needs (reducing likelihood of emergence of problems) and progress of implementation of strategy (reducing the gap between strategy and implementation).

Lack of cultural identity is considered to be a typical case of a sociotechnical problem in smart cities. Songdo in South Korea is an example that has become an innovative laboratory for policymakers and advanced technology [38], but is described as a city without soul [39]. In smart cities built from scratch, the emergence of a lack of cultural identity is inevitable

compared to that of people living in long-established cities. Part of the reason is because there is little cooperation between service providers and beneficiaries, a problem that was addressed in the present study with the proposed SVN (Fig. 2).

Conclusion

Kashiwa-no-ha Smart City maintains goals for sustainable development and has developed a strategy to achieve these goals. The implementation of this strategy has resulted in the establishment of UDCK, a platform overseen by a public-private-academic partnership to facilitate smart city stakeholder collaboration. Despite the creation of a strategy to promote the sustainable development of Kashiwa-no-ha, newly emerging sociotechnical problems were found, indicating implementation of the strategy has not been completely successful.

Based on the above findings, we conclude that some stakeholders (residents, businesses, incubators) are not adequately connected in Kashiwa-no-ha. By utilizing a systems approach in line with a transdisciplinary concept of a “living lab”, bottom-up stakeholder collaboration can take place to ensure services provided are aligned with stakeholder needs and in return bridge the gap between strategy and implementation, reducing the strain of sociotechnical problems.

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5

Considering Human Factors in Characterizing the Gap between Strategy and Implementation

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This paper outlines a causal loop diagram model to explain, and suggest solutions for, a gap between strategy and implementation. The model is specific to certain industries: mature process industries producing commodity products, having a workforce dominated by hourly frontline workers, requiring substantial capital investment, and burdened with heavy regulation due to the physically risky nature of their processes. This model is a generalization of clear patterns found by a management consulting business with clients in these industries. I posit that for these industries, a trust gap between management and frontline workers is a natural outcome of externalities and organizational dynamics unmitigated by systems thinking. A trust gap may be one important cause of a strategy/implementation gap.

Introduction

Disclaimer

This paper articulates qualitative insights gained from my experience as a human factors management consultant and from an understanding of my consultancy partners' previous experiences. Our operational sensibilities are grounded in our shared experiences as naval aviators operating complex, dangerous equipment on strategically deployed aircraft carriers. Additionally, I have approached this work with a view through the lenses of my MIT SB/SM education in control systems engineering and my post-Navy MIT System Design and Management (SDM) experience. To be clear, this paper is not the result of rigorous peer-reviewed primary research. It is an up-to-date summary of my professional opinions regarding characterization of, and some solutions for, the Gap in a specific type of industry.

Industry Specifics

The common characteristics of the industries in which our clients participate are as follows:

- Process industries such as oil and gas extraction and refinement, chemical manufacturing, pharmaceutical manufacturing, and commercial construction. We have not worked with product development or even "widget" manufacturing companies.

- They are industries in a mature state of growth, producing commodity products.
- The organizations are large (typically global) and complex, with a workforce dominated by hourly frontline workers. Investment in structural capital is high, and requires substantial maintenance and training for its operation.
- These industries are heavily regulated because they are sources of human-produced disasters involving fatalities, community endangerment, and environmental damage. A relatively recent illustrative example is the Deepwater Horizon oil spill. Others include the Texas City refinery explosion in 2005, the *Exxon Valdez* oil spill in 1989, and the Bhopal, India, disaster in 1984.

Summary

The insights described in this paper have been gleaned from strong patterns of organizational behavior identified in work with seven clients across the industries listed above. The patterns are, at least in the context of our self-selected client base, clearly generalizable.

We find several specific, interacting organizational dysfunctions, which lead to a rash of safety incidents. Beyond their proximate causal factors, the organizations initially do not fully understand these incidents. Using causal loop diagrams, we see these incidents are tied to workforce disengagement, waning innovation, unsustainable financial performance, and entrenched distrust between management and frontline workers.

The Trust Gap

A generalized description of our clients' organizations includes a safety department separate from operations and something they may call an incident investigations program. Their safety metrics have plateaued or started creeping back up (less is better). Management team members share an uncomfortable feeling that the only reason they haven't made the news with, for example, an uncontained spill, is a simple matter of luck—statistics temporarily in their favor. Typically, they sense something is deeply wrong, and have an inkling it has to do with "culture." But they don't know how to pinpoint the root problems or begin work on long-term solutions.

In that context, we inevitably see a Trust Gap between frontline workers and middle and upper management. When the people primarily responsible for executing strategy and the people primarily responsible for conceiving and distilling strategy do not trust one another, it seems unrealistic to hope for anything other than a gap between strategy and implementation. Therefore, for organizations that have benefited from our help, a leading cause of their Gap is a Trust Gap.

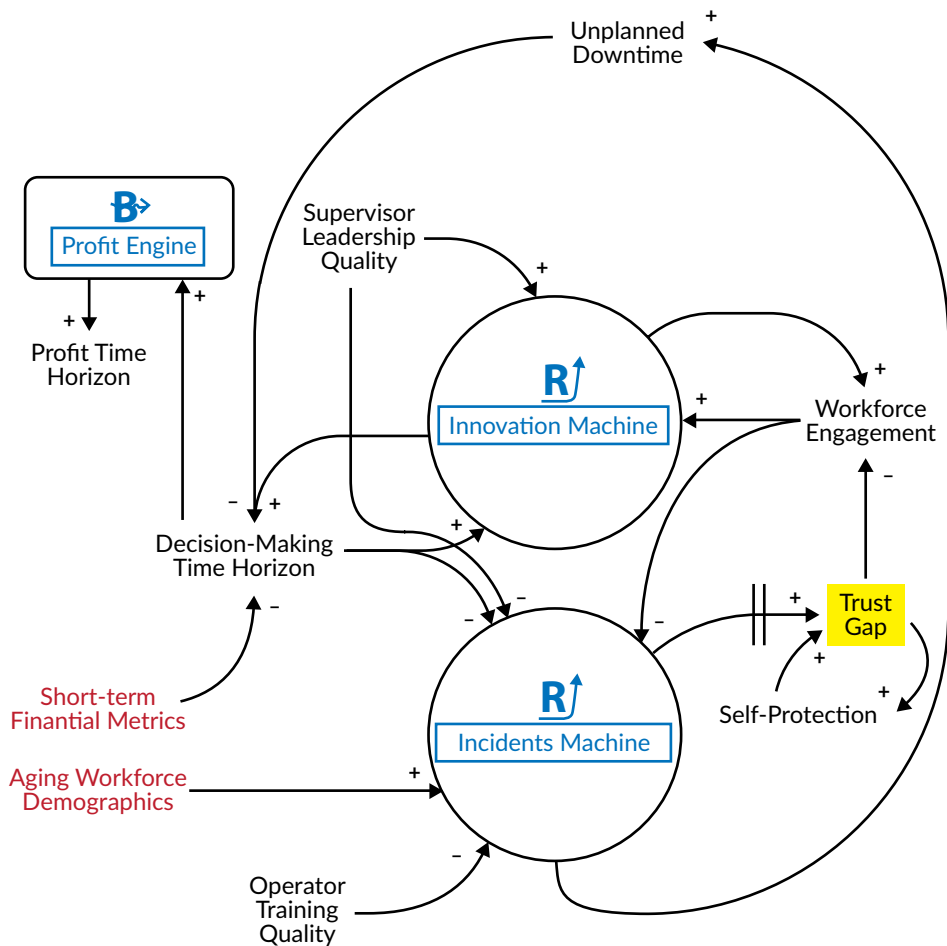


Figure 1: Causal Loop Diagram Highlighting a Trust Gap for Businesses in Mature, Physically Dangerous Industries

In the interests of operationalizing our consulting work and providing solutions to address root cause issues, we have characterized the Trust Gap using causal loop diagrams. This paper will outline, step-by-step, construction of the model in Fig. 1.

In a nutshell, the **Trust Gap** is driven by a reinforcing loop of **Incidents** and blame, exacerbated by a tendency for the workforce to engage in **Self-Protection**. **Innovation** is stifled in a negative reinforcing loop of **Workforce Engagement** (driven, in part, by the **Trust Gap** itself) and a pervasive short-term **Decision-Making Time Horizon**. The resulting **Unplanned Downtime** further aggravates short-term thinking, which in turn negatively impacts overall sustainability. Externalities include the imposition of **Short-term Financial Metrics** and **Aging Workforce Demographics**.

“

...the Trust Gap is driven by a reinforcing loop of incidents and blame, exacerbated by a tendency for the workforce to engage in self-protection...

”

A Sense of Urgency

In building our model, we start with a simple shared mental model describing a process manufacturing business. It involves **Production** and **Revenue**; **Cost Control** and **Cost**; and **Profit** (Fig. 2).

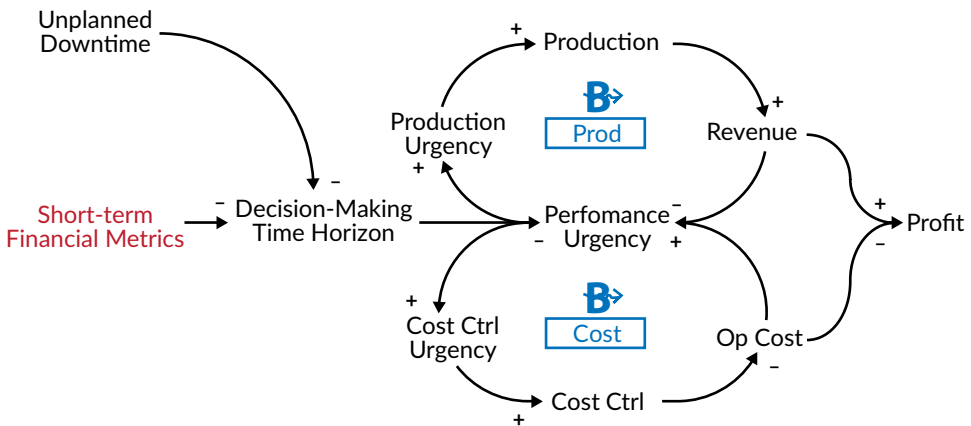


Figure 2: A Simple Production Model Driven By Urgency

We also acknowledge the importance of a sense of urgency. **Production** and **Profit** are natural priorities for this type of business. “Urgency” is another way to say the **Decision-Making Time Horizon** is relatively short. This follows naturally from the influence of arms-length (primarily financially motivated) investors, public or private, and from any **Unplanned Downtime** created internally.

When external stakeholders impose **Short-term Financial Metrics**, the organization’s upper management will tend to have a **Decision-Making Time Horizon** of equal or shorter timespan. Successively lower levels in the hierarchy will have, as a rule, successively shorter decision times. A pervasive tendency for short-term thinking is incompatible with sustainability in any form, including long-term profitability.

A brief note of differentiation: I think of agility as a repeating pattern of discernment punctuated by decisive action. Short-term decision-making is something else: A frenetic element of the organization's culture.

We summarize this portion of the big-picture causal loop diagram in Fig. 3.

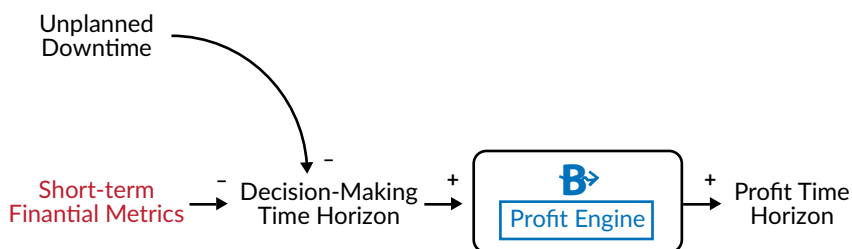


Figure 3: Balancing Profit Engine with Open-Loop Time Horizons

In this model, the profit engine tends to balance profit in response to disturbances. But the “time horizons”— decision-making and reliable profitability—are what a controls engineer would call “open-loop”. Therefore, chronic downward pressure on decision-making times would seem to result in waning sustainability for the organization.

Incidents and Errors

For this type of business, process safety is a key metric, in large part because it is a matter of social responsibility to avoid accidents.

Clarification: Incidents are events in which an injury, ill-health, or fatality occurred or could have occurred. Accidents are incidents in which one or more of those negative outcomes actually did happen.

Process safety accidents can be disasters, killing people, poisoning nearby communities, and severely damaging the environment. Additionally, disasters can halt production for weeks, months, or even years, which is obviously not aligned with any reasonable strategy. Furthermore, disasters can trigger additional governmental regulation, which may or may not head off the next disaster, but does add to the industry’s regulatory burden.

Incidents should trigger incident **Investigations** (Fig. 4). An investigation is meant to uncover the causes of the incident and recommend solutions. Outside of aviation and the nuclear industry, we consistently note that investigations are shallow. They tend to focus on proximal causes like equipment failure, the reasons for equipment failure, and operator error. The investigators’ recommendations tend to address procedural details (**Special-Case Process Mods** and **Equip Mods & Workarounds**) and operator responsibility (**Blame Operators**). When

incident investigations are shallow and hurriedly done, the more incidents there are, the more perfunctory the investigations tend to be (**Findings Depth**).

A short **Decision-Making Time Horizon** reinforces any tendency for shallow investigations, and also impacts the organization's commitment to procedural consistency and documentation (**Maintenance of Procedures**) and **Preventive Maintenance**. In turn, procedures become riddled with inconsistencies and special cases, often not well documented (**Standardized Procedures**). **Equipment Reliability** also suffers, as well as operators' **Confidence in Equipment**. **Operator Competency** is impacted by several factors *outside the direct control of the operators themselves*—**Confidence in Equipment**, **Standardized Procedures**, **Operator Experience**, **Operator Training Quality**, and **Supervisor Leadership Quality**. Degraded competency and equipment obviously lead to more **Incidents**.

These companies often experience high workforce **Turnover**, which reduces **Operator Experience**. High turnover is partly due to an uncontrollable externality, the **Aging Workforce Demographics**. However, **Workforce Engagement** (or lack thereof in the form of disenchanted and disgruntled employees) is a strong influence on **Turnover**.

Note that there is a nested reinforcing loop of **Incidents** in this model. Management's tendency to blame operators for **Incidents**, along with an upward trend in **Operator Error**, creates over time a growing bidirectional **Trust Gap** between frontline workers and upper management. There is an explicit delay in the development of and, more importantly, mending of, the **Trust Gap**. This is meant to reflect the idea that trust has inertia. As for any inertial body, to change the direction of a trend in trust, one must display a *consistent pattern* of new behavior.

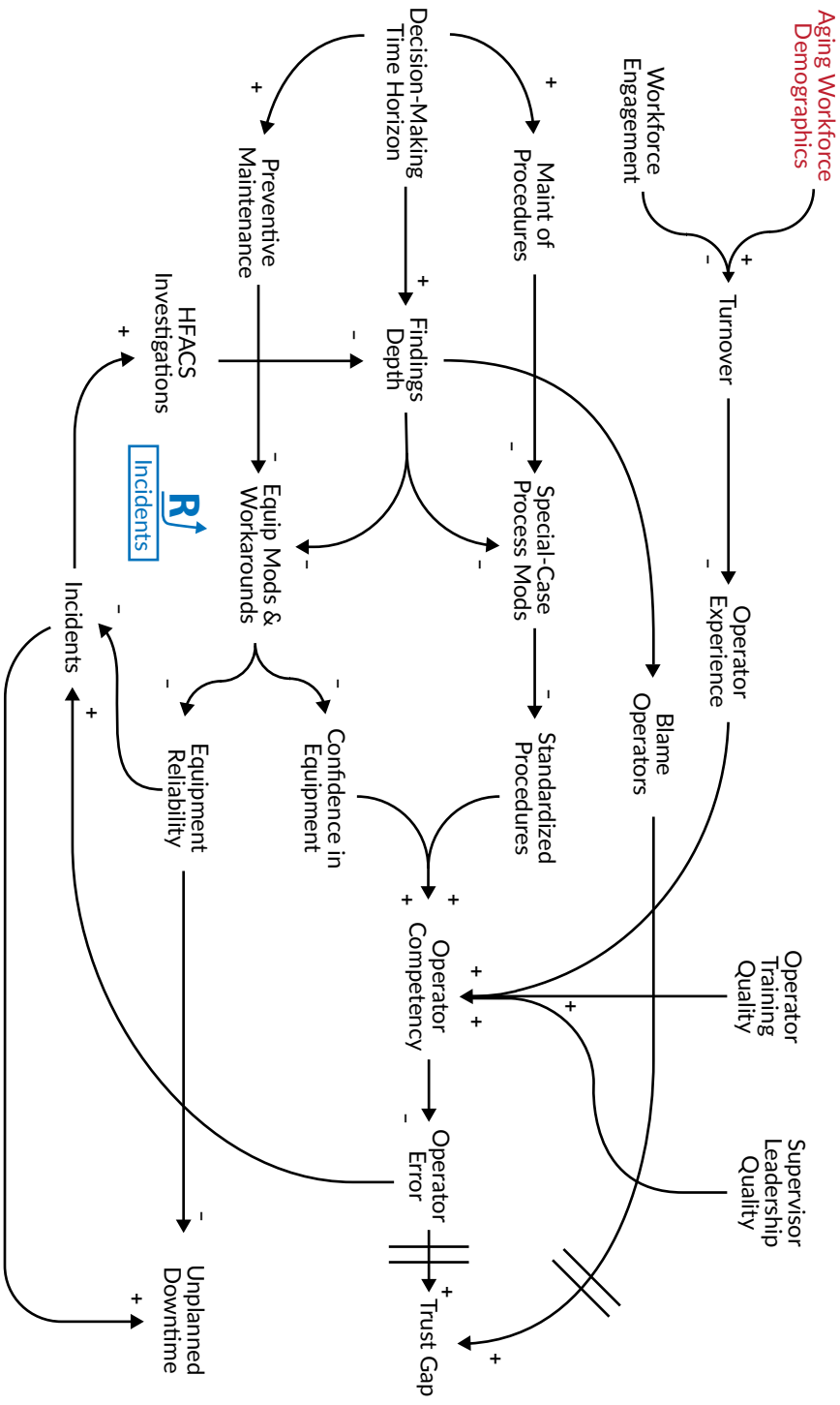
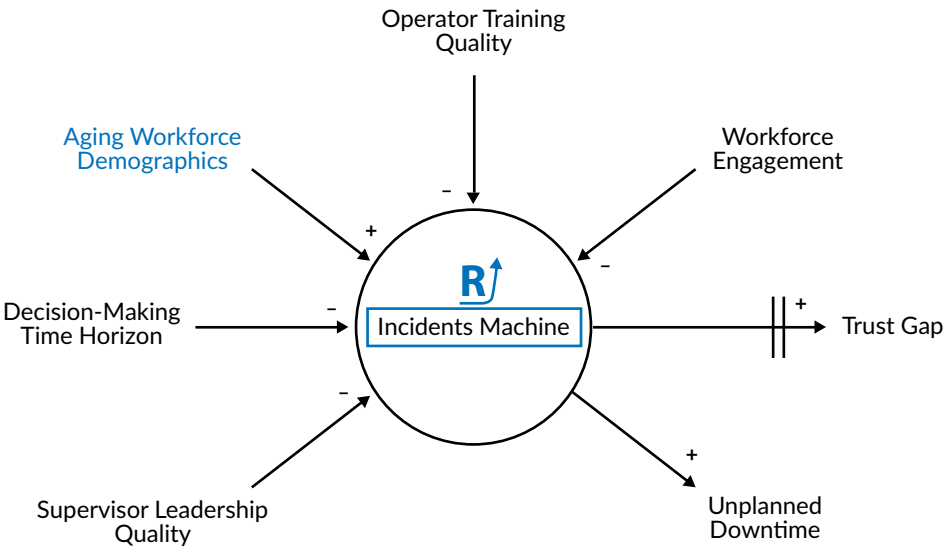


Figure 4: Reinforcing Incidents Loop Leading to a Trust Gap

A brief aside: Middle managers are rarely given the awareness, tools, or authority to truly solve the Trust Gap problem. Unempowered, then, to lead the organization out of the quagmire, they are left to manage the entrenched dysfunctions. Much has been written about the plight of middle managers. This causal loop diagram helps explain why it is so often an untenable

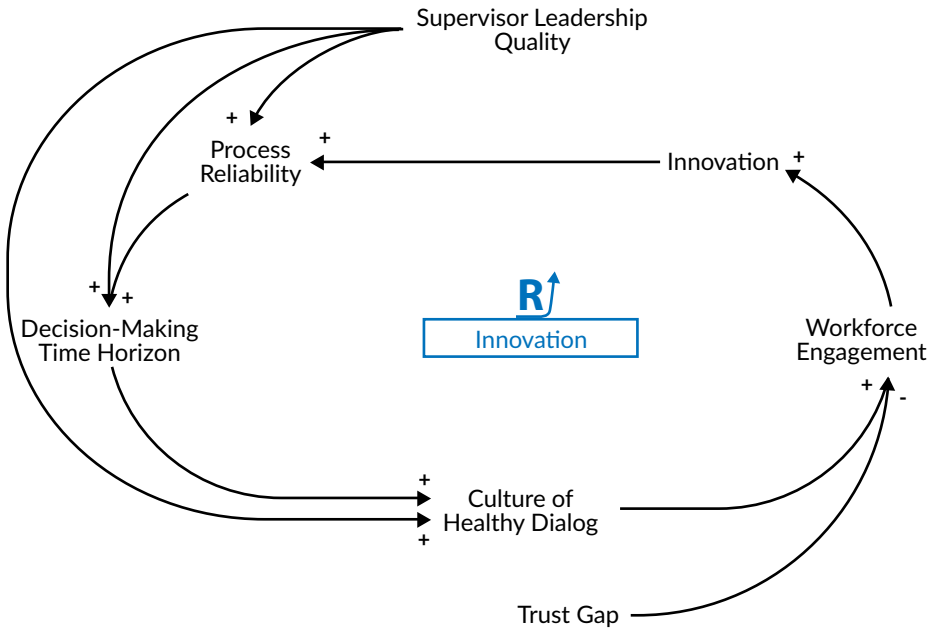


position, at least for this type of business.

Figure 5: The Incidents Machine and Eroding Trust

We can summarize the **Incidents** loop as an unregulated **Incidents Machine** that, left to its own devices, generates a **Trust Gap** and **Unplanned Downtime** (Fig. 5).

At this point, it is appropriate to acknowledge—and make sense of—the prevalence in our model of qualitative “human factors” like workforce engagement, trust, and leadership.



Innovation and Ingenuity

Figure 6: Reinforcing Innovation or Declining Innovation

A **Culture of Healthy Dialog** (Fig. 6) is vital for reliably high performance, in terms of both profit and safety. Examples of healthy dialog include active listening in service of true curiosity, performance transparency at all levels of the hierarchy, and what the High Reliability Organization (HRO) literature [1] calls deference to expertise.

A note about culture: I think of organizational culture as the expected content, quality, and tone of interactions among its people; those expectations derive from current and past interactions; interactions can be directly experienced, personally witnessed, or simply described by others. This leads to three important notions about culture.

- Interactions among members of the organization should be of primary concern to leaders.
- Culture has inertia. If it is moving in the right direction, it serves the purpose of reducing the management burden, leaving more room for strategic and forward thinking concerns. Changing culture is like changing the direction of a flywheel: it is best achieved with consistent force applied smoothly over time.
- It is leaders' job to initiate and nurture a healthy culture. Whether done purposefully or not, leaders make culture.

Application of a “consistent force” in an organization requires farsightedness. Long decision times do not necessarily imply a **Culture of Healthy Dialog**, but short **Decision-Making Time Horizons** certainly impede healthy dialog.

Healthy dialog is essential for sustained **Workforce Engagement**. One of the reasons engagement is so important is it drives **Innovation**.

Two outcomes one can count on from all human beings: error and ingenuity. A healthy organization turns error into opportunity (“Incidents and Organizational Learning” below) and steers ingenuity towards innovation rather than workarounds and self-protection (Figs. 4 and 6).

Essentially by definition, an engaged workforce will contribute to organizational innovation. **Process Reliability** then benefits, easing the downward pressure on decision times.

However, a **Trust Gap** works strongly against **Workforce Engagement**. With eroding trust, the reinforcing **Innovation** loop spirals downward, taking **Workforce Engagement** with it.

A key force potentially offsetting the **Trust Gap** is **Supervisor Leadership Quality**. Leaders, especially frontline leaders, have direct influence on **Process Reliability**, **Decision-Making Time Horizons**, and **Culture of Healthy Dialog**. Of course, as shown in Fig. 1, leadership quality and trust are linked via complex interactions and at least one important time delay. I have not witnessed high-quality supervision in tandem with a large chronic trust gap, although it could theoretically exist, but I suspect only in transition.

Summarizing the **Innovation Machine** in Fig. 7, we see a reinforcing loop of (growing or declining) **Innovation** linking **Decision-Making Time Horizon** and **Workforce Engagement**. **Supervisor Leadership Quality** works in favor of a growing **Innovation** loop.

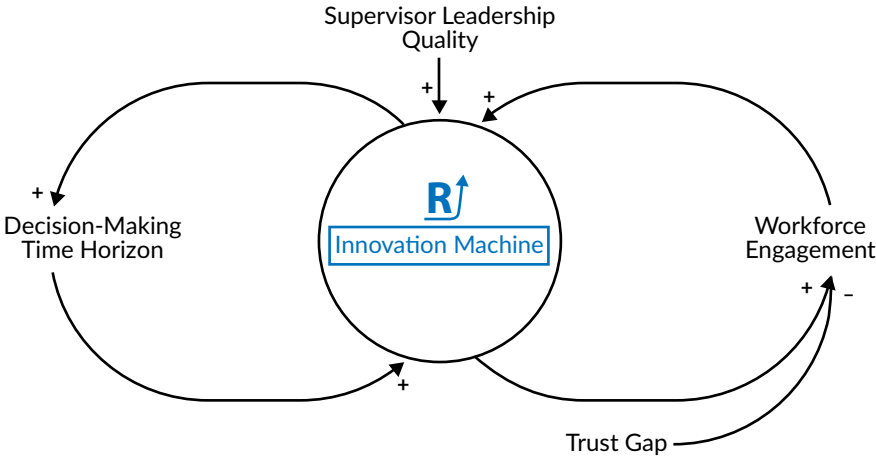


Figure 7: Innovation Machine Linking Decision Time, Leadership, and Workforce Engagement

The Big Picture

Referring again to the causal meta-loop diagram of Fig. 1, a few more insights become apparent.

Self-Protection is a phenomenon we have noticed in our work at least twice, which can present a powerful obstacle to closing the **Trust Gap**. This occurs when frontline workers, often abetted by supervisors, prioritize their immediate colleagues' well-being (physical safety, job security, and level of exertion) over edicts from upper or even middle management. This derives from the **Trust Gap**—"management doesn't have our best interests in mind" and/or "management doesn't understand what we do down here"—and then directly exacerbates the trust gap itself.

Short **Decision-Making Time Horizons** are natural responses to common externalities (**Short-term Financial Metrics** and **Aging Workforce Demographics**) in combination with human realities. When not purposefully balanced by farsighted leadership, short-term thinking invades nearly every aspect of these organizations. The results are systemically dire.

There is a reinforcing meta-loop around **Incidents, Unplanned Downtime, and Decision-Making Time Horizon**. With a few default organizational dysfunctions (poor incident investigations, haphazard leadership standards, and open-loop training practices) in place, Incidents cause Incidents. Sooner or later, statistics catch up and disaster happens.

Innovation and **Incidents** tend to work in opposition with a time delay. The organizational practices that lead to healthy culture, and therefore strong innovation, also, over time, lead to a balancing Incident loop (see "Incidents and Organizational Learning" below for more on this).

Hinting at Solutions

Referring again to Fig. 1, there are three obvious leverage points at which to apply programmatic solutions—**Workforce Engagement, Operator Training Quality, and Supervisor Leadership Quality**.

Worth noting: There are no easy answers, and none that involve anything short of fundamental organizational change. The issues at hand are self-reinforcing and complex, ultimately driven by deep-seated human nature. The sustainable path to lasting cultural change involves structural organizational change that turns the very same unavoidable human realities into positive self-reinforcing organizational characteristics.

Workforce Engagement

High-quality training and high-quality leadership, along with the opportunity to develop oneself as a leader, encourage workforce engagement. Another key tool, we find, is a clear unifying purpose (similar to Jim Collins's Big Hairy Audacious Goal, the BHAG) [2]. The BHAG does not work alone, however. It needs to be supported by a set of comprehensive hierarchical holistic metrics carefully aligned, tracked, and published throughout the organization.

Operator Training Quality

A preponderance of operator training in these industries is time-based—essentially open-loop. People are counted as “trained” if they’ve sat in a classroom in the presence of a lecture on an important topic. There may be an in-class written post-test, but there also may be no field-based proof of competency.

“Competency training,” in contrast, requires both written and hands-on demonstration of competency in the field. Qualifications must be tracked and renewed. They are very specific to equipment or processes; increasing levels of qualification require advanced levels of supervision. Think of pilot training as regulated by the Federal Aviation Administration (FAA) [3].

Competency training’s payoff is more than simply increasing operator competency, arguably sufficient in itself to warrant the program. It also serves to increase operators’ confidence in their own competence and signals that management deems their work worthy of investment. Furthermore, management naturally gains confidence in its workforce, which helps mitigate over-management and begins to heal the Trust Gap.

Supervisor Leadership Quality

There is much to say about high-quality leadership behaviors. The details fall outside the scope of this paper. To quickly name a few, we teach these concepts to clients:

- Systems thinking, emphasizing emergent behavior and focus on interactions vice individuals.
- Purposeful awareness of decision-making times along with practices for deliberately high-quality decisions.
- Rules as boundaries—creating what the Navy calls an “operating box”—in favor of overly prescriptive rules.
- Curiosity as an organizational value.
- Emphasis on small-team successes vice individual or organizational successes (without ignoring the latter two).

Reliably high-performing organizations, in our observations, have an in-house customized leadership development program. Leaders are deliberately developed throughout their careers. This stands in contrast to “hopeful hiring,” which leaves individuals to figure it out in situ; and worse, promotions based on seniority or narrow technical skills.

Incidents and Organizational Learning

Another leverage point for solutions is non-obvious from the causal meta-loop diagram (Fig. 1). We typically start a client relationship by helping them “rewire” the **Incidents Machine** (Fig. 8).

Human Factors Analysis and Classification System (HFACS) Investigations, by design, delve much deeper into the human realities behind errors in judgment, equipment failures, and procedural missteps. Note that flipping the sign of the causal arrow leading from **HFACS Investigations** to **Findings Depth** changes the nested **Incidents** loops from reinforcing to balancing.

For these industries, HFACS is a cornerstone organizational competency for building a disciplined learning organization. HFACS investigation techniques are based on the Naval Safety Center’s incident investigation program.

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Reliably high-performing organizations, in our observations, have an in-house customized leadership development program.

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A consulting business practicality: We find the issues of safety and social responsibility (disaster avoidance) are tangible pain points for this type of organization. Helping companies establish an HFACS-based investigation program also serves to turn the systems thinking “light” on. From there, other programs like competency training and leadership development become more fruitful conversations.

Summarizing HFACS in two broad strokes:

1. Assume everybody involved was trying to succeed and did what made sense at the time... so what cultural and leadership factors led to those sensibilities? In other words, rather than asking, “What was he *thinking*??” ask instead, “Hmm, what *was* he thinking?” And then really listen.
2. Find the lessons for leaders. What must they change about their own behaviors to better align frontline workers’ behaviors with strategy? The deeper an investigation team digs for causal factors, the broader the impacts of any recommended changes.

What We Know

Based on our experiences with clients, we can judge to some extent the viability of this assessment of The Gap along with our proposed solution set.

HFACS turns on the systems thinking “light bulb” for leaders. Many of them recognize immediately the importance of circular causality in their organizational dynamics. There is a shift away from blaming individuals and towards their own leaders’ culpability in the entrenched dynamics.

Perhaps most telling, we have found that, in direct contrast with reasonable expectations from organizations displaying a Trust Gap and Self-Protection, entire hierarchies embrace solutions recommended as a result of HFACS investigations.

Causal loop diagrams are a natural synergistic fit with HFACS investigations.

What We Believe

As consultants, we have come to believe in five key principles that undergird our work:

- High performance (both profit and safety) is an *emergent* organizational property. It cannot be achieved by edict.
- Systems-thinking leaders focus on interactions and cultural health more than individual stars or pet projects.

- Culture has inertia. Change requires consistent force applied smoothly over time.
- Error and ingenuity are two sides of the same human coin. Healthy organizations make room for affordable mistakes so a) the organization can learn from individual errors, and b) individuals direct their ingenuity to solving strategically aligned problems rather than to finding workarounds or achieving self-protection.
- Curiosity, the basis for HFACS investigations, is an essential cultural value.

What We Don't Know

Several opportunities for further investigation and rigorous research remain:

- The viability of the ideas expressed in this paper would best be confirmed by long-term success of clients who have accepted help in implementing our recommended solutions. The time horizon for success is measured in more years than we have been at work so far.
- We do not know to what degree this analysis applies to other industries.
- We do not know how smaller organizations might benefit from these insights.
- We do not know the relevance of our work to industries in other stages of maturity.

Acknowledgment

I thank David Wilbur, founder and CEO of Vetergy Group, for his support of this project and help in development of the generalized causal loop diagram model.

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6

Achieving disaster preparedness with urban agriculture in cities: A model-based strategy to meet dietary nutrients needs during post-disaster situations in Tokyo, Japan

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Abstract

The implementation of disaster preparedness in Japan have been considered as a good example around the world. However, research in the aftermath of The Great East Japan Earthquake, tsunami, and Fukushima Daiichi nuclear power plant accident showed that there are still gaps between the strategy and implementation of disaster relief. The affected populations suffer from non-specific dietary related health issues. Studies have shown that utilizing other nutritious sources can reduce negative health impacts. Therefore, the objective of this study is to determine the best policy option to implement an increase in resiliency using systems thinking by the utilization of dietary nutrients from urban agriculture during emergency situations. A Stakeholder Value Network is developed to identify the stakeholders and to align the implementation with the nutritional needs of the beneficiary. The results show that professional farmers become main stakeholders but hobby farmers and owners of vacant lots can also contribute to the increase in resiliency. In fact, the study shows that a self-sufficiency, in the best-case scenario, of 67.94% can be achieved. All in all, this study shows the importance of conducting a solution scan outside of the existing systems boundary to allocate resources to the right stakeholders and as a result ensure a better implementation of strategy.

Introduction

The majority of the world population lives in urban areas, of which 60% is prone to natural disasters [1]. This means that the implementation of disaster recovery strategies is of utmost importance. International organizations have reported challenges involving the distribution of food in disaster areas. To improve access to food during emergency situations, governments and households have different systems in place. These systems can be described in three stages. During the first stage, survivors utilize rations that will last up to three days in emergency situations. This food mainly consists of carbohydrates, providing energy, which is valuable during emergency situations to maintain activity [2]. During the second stage, a period which lasts from a few days up to several weeks, emergency food is provided by governments and international organizations. This food is similar to the rations in the first stage, resulting in a continued provisioning of primarily carbohydrates. Only during the third stage of emergency response is the normal food distribution gradually restored, leading to the availability of individual ingredients and fresh products that contain more diverse nutrients. These nutrients are needed to prevent both direct and indirect health issues. Studies [3], [4] showed that the restoration of the normal food distribution can take several months or years, causing survivors

to depend on emergency food much longer than intended, resulting in various health issues.

Although there is no integrated study, some studies show that there are alternative sources of nutrients available in disaster-prone areas such as large cities with high population densities [5], [6]. The development of a system for the distribution of available nutritional sources could possibly help to provide nutrients in emergency situations and thus prevent non-specific health symptoms, gastrointestinal symptoms, and cardiovascular diseases. This means that for an effective implementation there is a need to expand the perspective, what in this chapter is called systems boundary. This chapter discusses how the current strategy does not consider the existing opportunities of the city, which often has a large number of fresh products to offer containing the necessary nutrients, and what it must do to improve its implementation.

Urban agriculture has been identified as one potential source of nutrients in cities. In theory, fruits and vegetables grown in urban agricultural lands can help prevent the health issues described in post-disaster studies [7]. The benefits of UA to social, environmental, psychological and physical health on a day-to-day basis are widely described in literature and promoted for disaster recovery and community building. However, at present, disaster preparedness strategies have not included the utilization of a nutritious source in the local area [8], calling for the need to model its implementation. Therefore, a strategy needs to be developed to bridge the gap between the need and availability of dietary nutrition for disaster situations.

To ensure implementation, an understanding must be formed of the complex stakeholder relationships, beneficiaries, and the impact of policy changes on the nutrition availability as well as other services provided by UA [9]. Despite decision makers having good intentions, this complexity is particularly high in urban environments where there are varying stakeholders and pressures from competing land uses, creating challenges to make changes (e.g. to infrastructure) necessary for development and the future needs of the city. Previous research indicates that systems thinking can help to comprehend such complexities. Systems thinking includes a Stakeholder Value Network (SVN), to document the needs and roles of the stakeholders and the values they can provide. Next, scenario modeling can help determine the best-case scenario for policy changes and how it can best contribute to the needs of the beneficiary. Finally, based on these results, a roadmap can help describe the necessary steps to ensure implementation of the strategy and policy change.

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In theory, fruits and vegetables grown in urban agricultural lands can help prevent the health issues described in post-disaster studies

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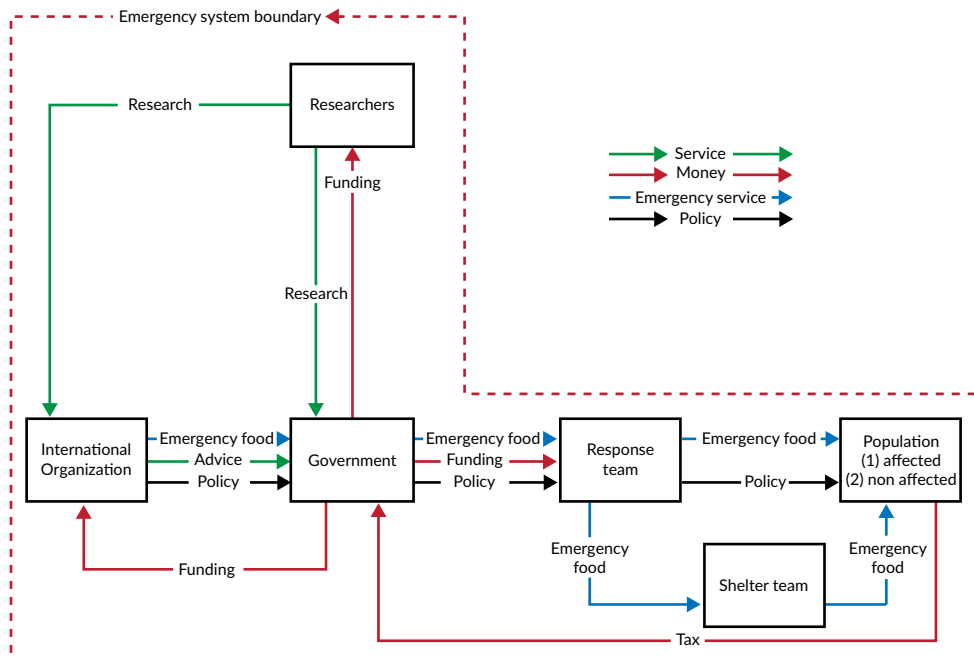


Figure 1: Current Stakeholder Value Network for disaster preparedness

Research design

The objective of this chapter is to describe a process of utilizing systems thinking to improve the strategy and implementation in urban planning. The case is built on a research project that focuses on designing a new implementation of an improved disaster preparedness strategy. In this case, there is a search for the best policy option to implement an increase in resiliency in urban planning using systems thinking by the utilization of dietary nutrients from UA. To do so, the existing strategy for distribution of emergency food is analyzed with the help of a Stakeholder Value Network (SVN). The SVN helps to identify stakeholders, their needs, and roles for the case of Tokyo. Next, a modeling approach was chosen to support disaster preparedness strategies and to develop a concrete roadmap for the implementation of the strategy. It is hypothesized that the established stakeholders in the agricultural sector can help with the implementation of the disaster preparedness strategy by providing fresh fruits and vegetables as a source of dietary nutrition.

Methodology

An SVN is developed to show the current stakeholder relations. Data was derived by conducting a literature review on papers discussing disaster recovery and emergency response, interviews with key stakeholders, and observations during an emergency drill in Nerima ward

[5] with a particular focus on disaster preparedness. To ensure a holistic understanding of the opportunities at hand, the systems boundary was expanded to conduct a solution scan.

Next, data is derived from a study using Geographic Information System (GIS) to identify farmlands, the reference consumption of the population, and self-sufficiency within cells of 1km² [10]. This unit of analysis is also used by the Tokyo Metropolitan Government (TMG) for spatial analysis. This means that the results can be coupled with various other data sets at hand. Based on the production results from GIS and TMG, policy scenarios are developed based on expected changes in strategy and potential opportunities to model the trade space of nutritional self-sufficiency for adaptation of UA in disaster preparedness strategies. By conducting this analysis, a more evidence-based and informed decision can be made by policy makers.

Scenario	Title	Description
1	Professional farmers	Utilization of land use data and estimations from previous study on the production in the present case study [10]
2	Hobby farmers	Based on results from municipal databases and remote sensing on the locations of hobby farms [10]
3	Current state	Based on latest land use data including S1 & S2 (2015) [11]. This scenario assumes that hobby farmers contribute to the production in each grid cell
4	Steady state	Based on the estimations of current state (S1 & S2) and anticipation of reduction of farmlands based on previous trend (40% in 10 years)
5	Policy context	Agricultural land uses in urban area have a tax exemption under the "Productive Green Land Act" scheme if farmers commit to farming the land during the next 30 years. The designation initiated in the year 1992, which means that from the year 2022, over 13,442 hectares of farmlands will be eligible for transformation in other land uses [5]
6	Potential	Includes vacant lots from land use data and applying indicators from hobby farmers [10], [11]
7	Evacuees	Modeled based on the needs of evacuees estimated in a scenario developed by The Tokyo Metropolitan Government, which assumes a 7.3 magnitude earthquake under Tokyo Bay North Area (worst case scenario) would force 3,390,000 evacuees (26% of population) [12]
8	Potential and evacuees	Modeled with potential scenario and evacuees (S6 & S7)
9	Vulnerable groups	Focuses on vulnerable populations because previous studies indicate that children (12.3% of the population under 15 years old), lactating women (no data), and elderly population (27.8% of the population over 65 years old) are particularly at risk of non-specific health issues [2]
10	Targeted	Considers all the above circumstances such as potential, evacuees, and vulnerable populations (S8 & S9)

Table I: Scenario development for tradespace exploration

Finally, based on the abovementioned results, a new SVN is developed alongside a roadmap to ensure better implementation of the strategy to provide UA nutrients for the population during emergency situations while taking into consideration the preexisting complex stakeholder network. The results then lead to policy implications.

Results and discussion

The present stakeholder relationship of the disaster preparedness strategy in Fig. 1 is found to be effective for its function (to provide energy in the form of carbohydrates), however, there are missed opportunities that can solve the abovementioned needs gap of the beneficiaries (in this case the population) as identified in previous studies for nutrient provisioning.

The empirical land use analysis found that in 1479 cells of 1km², a total of 48,773 professional UA plots cover 54,409,728m² and 490 hobby UA plots cover 664,172m². The median fruit and vegetable self-sufficiency of the current scenario in each grid cell was 4.13% with large variations based on the location off the cell as shown in Fig. 2. Furthermore, a land use analysis showed that there is a considerable amount of vacant lots in the present case study. These lands have no designated use and are therefore not utilized to their potential. A policy scenario was created to consider vacant lots in the production model for disaster preparedness.

Based on this data, the tradespace of the policy scenarios was visualized in which it was shown that increasing UA by utilizing vacant lands will increase the self-sufficiency and thus resilience of the population.

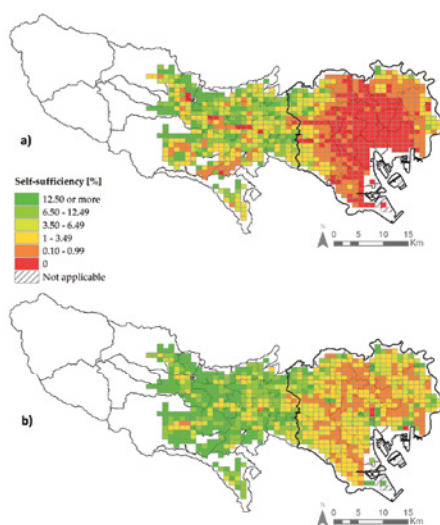


Figure 2: Visualization of self-sufficiency model in 1km² grid cells for case study Tokyo with a) current estimated self-sufficiency, and b) potential self-sufficiency (blank spots indicate lack of agriculture lands or residents). Adopted and modified from [10]

A total of ten different scenarios were modeled for the exploration of the tradespace based on availability of different land uses, emerging changes in policy or the effect of policy, and a focus on targeted populations (particularly vulnerable to dietary related health issues during post-disaster situations). The results in Fig. 3 indicate that when policy implications are made to ensure the livelihoods of farmers, continuation of the designation of agricultural land uses under the Productive Green Land Act need to be assured. When a focus can be made on vulnerable target groups, a considerable amount of fresh fruits and vegetables (67.94% of the total need) can be supplied to avoid the introduced health issues. It is seen that the utilization of individual types of land uses does not offer a high self-sufficiency, however, aggregating several types of land uses may hold the solution to provide sufficient nutrients to affected populations.

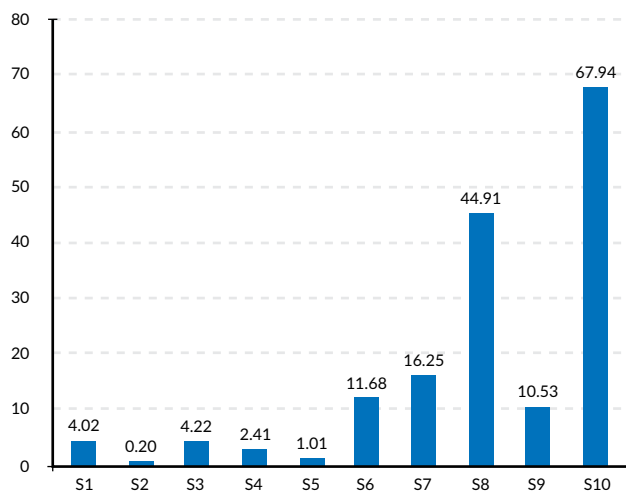


Figure 3: Self-sufficiency results by scenario analysis

A focus on the beneficiaries was made resulting in the exploration of alternative possibilities of providing nutrients during emergency situations. It was key to provide nutrients locally, because transportation systems in times of disasters are often unavailable due to heavy damages. The FAO had stated that agricultural production could be a significant source of emergency nutrition [7]. Therefore, the stakeholder relationship was identified in Fig. 4 including professional farmers. Japan is facing an aging society. Although the population in Tokyo is stable, the majority of farmers are over 65 years old and have difficulties finding successors [13]. Therefore, new forms of agriculture have been emerging in the form of hobby farming. On the one hand there are allotment farms that have different types of ownership (e.g., government), in which a hobby farmer has full use of the land. On the other hand, there are experience farms. In this case, a professional farmer owns the farm while a hobby farmer pays to experience farming. Japan Agriculture Cooperative, also known as JA, plays a mediator role, especially between the government and professional farmers. They have a strong presence and nearly all farmers in Japan have a membership.

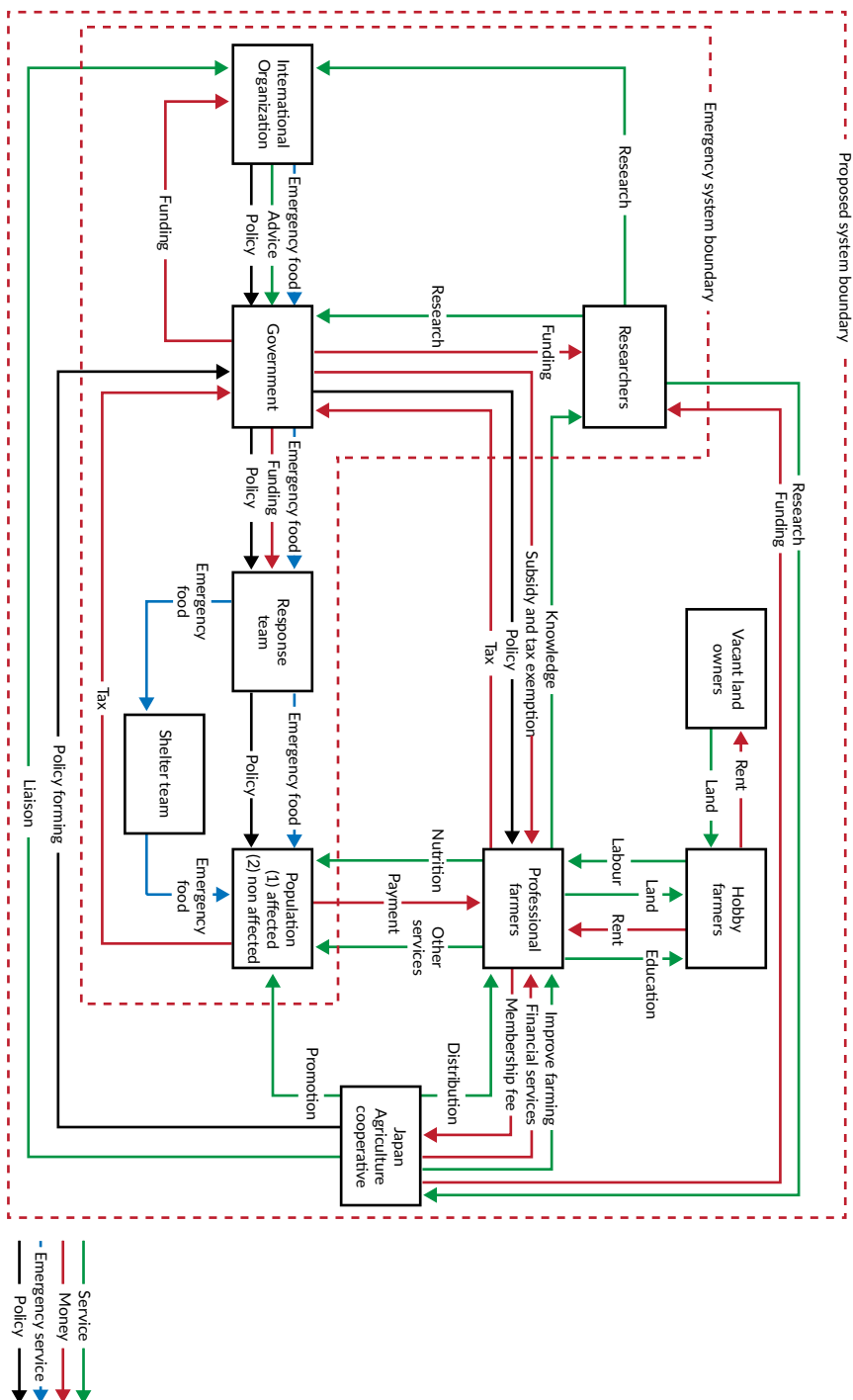


Figure 4: Proposed stakeholder value network for integrated disaster preparedness

To implement the strategy, both professional and hobby farmers can play a vital role. The SVN shows that they play an important role for the provisioning and distribution. The existing roles in the SVN for professional farmers can be applied in disaster situations by allocating and supervising hobby farmers for planting, maintaining, harvesting, and distributing. Previous studies showed that affected populations lost their appetite after several days of eating conventional emergency food. Therefore, community volunteers can help with the preparation of meals to maximize intake of nutrients and distribution to beneficiaries (e.g. vulnerable population groups such as lactating women, children, elderly people) using a combination of fresh fruits and vegetables. Previous observations showed that local government can assist the farmers by providing gas cookers and subsidies for when their fields are harvested in emergency situations [5].

No.	Group or stakeholder		Needs
Existing stakeholders			
1	Residents	Affected	Disaster preparedness, variety in food, and comfort
2		Non-affected	Disaster preparedness, variety in food, and comfort
3	Government	Local	Disaster preparedness, tax, and good design
4		Prefectural	Disaster preparedness, tax, and good design
5		National	Disaster preparedness, and tax
6	Response team		Emergency food, and funding
7	Researchers		Funding and knowledge
8	International organization		Funding, research, and liaison
Proposed stakeholders			
9	Professional farmers		Payment, subsidies, and labor
10	Hobby farmers		Land, agricultural. education
11	Japan Agricultural Cooperatives		Good members
12	Vacant land owners		Profit from rent

Table II: List of stakeholders and their needs

The scenarios chosen for this study resulted in a total potential self-sufficiency of 67.94% from agricultural land uses for targeted populations. These results indicate the added value that agricultural land uses can have to increase the resilience of populations living in megacities. The analysis focuses on the potential for nutrients, however, the scenario analysis is conducted based on kilogram fruits and vegetables because each nutrient has a different reference consumption and priority in disaster situations. As a final proposal, a roadmap will help to improve the implementation of the strategy. The roadmap will help to allocate resources to the right stakeholders and ensure the necessary steps are followed to ensure preparedness for when a disaster occurs:

1. Identify agricultural plots in the city
2. Estimate potential production throughout the year
3. Identify stakeholders
4. Allocate roles to stakeholders
5. Provide financial support to key stakeholders that maintain activities
6. Identify affected population during disaster and their needs
7. Identify target groups (vulnerable population)
8. Distribute nutritional resources
9. Assessment of the implementation
10. Share lessons learned and repeat process

Conclusions

This chapter provided a model-based sociotechnical strategy to ensure implementation of the use of dietary nutrients from UA as disaster preparedness strategy in addition to existing emergency strategies in cities. The model helped define the best-case scenario, formulate the roles of each key stakeholder in emergency situations, and enabled descriptions of the steps needed for each stakeholder to complete its role. The motivations of each stakeholder to implement UA are described and it was shown that UA could provide a considerable amount of vegetables containing valuable nutrients in post-disaster situations for the prevention of health issues reported in post-disaster studies. It was shown in Scenario 10 that an aggregated use of different land uses, resources, and stakeholders could lead to a better strategy.

This chapter also found that adding complexity to the system, by expanding the system boundary, can lead to the results needed to ensure a good implementation. Additionally, based on the architecture of the SVN, a roadmap for implementation was developed, in which there was an emphasis on allocating resources to the right stakeholders, describing the roles of each stakeholder, and focusing on the right target groups to bridge the gap between strategy and implementation.

Future work can explore more strategies and scenarios to ensure better implementation of the disaster preparedness strategy and link the results with useable policy implications.

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7

Impedances that Cause Strategy-to-Implementation Gaps

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On the subject of the strategy-to-implementation gap, we adopt a new tactic. Instead of concentrating on success factors, we focus on the factors that can predict unsatisfactory and failed implementations. We intend to reason systematically and methodically to avoid disadvantages of crude “buy low, sell high” type maxims and proverbs. Specifically, we devote our attention to the following ideas:

- *Implementation fluency:* Fluency is the property of an implementation that can be characterized by a minimal number of implementation gaps. This means that the sociotechnical systems, which are enacting the strategy, are effective and free of dysfunctional surprises. The behavior of the sociotechnical systems satisfies [1], [2].
- *Strategy dysplementation:* Dysplementation is the absence of fluency. This is a fundamental idea. Our approach to implementation gaps is to identify the root causes of dysplementation so that we can attack and eliminate them. We argue that these root causes are like cancer and infections that ruin our health and make us ill. When we consult a physician, we want to know why we are ill and how to get well. We have less interest in nutrition, rest, and exercise, which are supposed to make us healthy. When we are sick, we want to know the disease that makes us unwell and the treatment to get well. Consequently, on strategy-implementation, we do not concentrate on best practices, tools, methods, and processes that research shows/claims to be effective. Instead we turn our attention to the elimination of the diseases of dysplementation and their causes.
- *Impedance.* Impedances are the pathogens that drive the dysplementation diseases. Our task is to understand the causes, nature, and specific effects of impedances. And by identifying instances and classes of impedances, we can attack them and reduce the occurrences of dysplementation.
- *Typology of impedances.* We identify four classes of impedances: 1) sloppy goals and objectives, 2) deficient capacity, 3) deficient capability, and 4) deficient readiness. Sloppy goals and objectives have been discussed elsewhere in this volume. We refer the reader to reference [3]. Capacity deals with resources and infrastructures required to implement a strategy. Capability deals with proficiency of the sociotechnical systems to use the capacity. Readiness deals with the preparedness to do what is needed, when it is needed, where it is needed, and with what is needed.

Introduction

Strategy and its implementation are like a three-legged race. It can be clumsy or it can be fluent.

Fluency is the most sought-after behavior of and during strategy implementation. Fluency is an emergent property of an implementation, which is characterized by a minimal number of implementation gaps. The strategy-enacting sociotechnical systems are free of dysfunctional surprises. Fluency is revealed by: efficacy of the strategy implementation, i.e. intended outcomes are produced – faster than planned, with a minimal number of costly interruptions, using fewer resources than planned; and it augments the stock of useful (personal and organizational) knowledge. Overall, the sociotechnical behavior more than satisfies. Regrettably, fluency is also most conspicuous by its rare presence in the vast majority of strategy implementations [4]. Far more common are the disruptions, faults, and flaws between strategy and implementation. These deficiencies drive **dysplementation**. As scientists and practitioners, we seek to understand fluency as a sociotechnical behavior, its independent variables, and working mechanisms. We seek to understand the phenomenon of fluency and the mechanisms that cause its absence. This article is about how to **attack dysplementation**, to improve the *fluency* of strategy implementations.

And how do you attack dysplementation? Answer, by removing and diminishing **impedance**. Impedances are factors that get in the way and prevent fluent implementations. These concepts were inspired by analogous concepts from different domains.

Medicine is the first source of inspiration. The ethos of medicine is good health. One way to promote health is to study and identify all the conditions and reasons that make people healthy, e.g. exercise, proper diet, rest, social relationships, and so on. Another way to address the question of health is to understand the diseases that make people *unhealthy*, then *attack* these diseases. Thus, we have medications like aspirin, penicillin, insulin, and so on. We can think that diseases are to health as impedances are to dysplementation. We think of impedance as a *pathogen*, the agent that causes a disease. Dysplementations are caused by pathologies in the strategy-enacting sociotechnical system; they are deficiencies – capacity, capability, and readiness.

The second source of inspiration is from the literature on customer satisfaction e.g. [5]. Instead of concentrating on what makes customers happy, their approach is to turn their attention on factors that drive customer dissatisfaction. These pernicious factors, they call *gaps*. Their approach to customer satisfaction is to systematically attack gaps. They develop the famous diagnostic gap-model¹, which has over six million Google mentions. We think that gaps are to customer satisfaction as impedances are to fluent implementations.

The third stimulus of inspiration is the Pugh Method from engineering design [6]. Using the Pugh Method, an engineer can systematically identify weaknesses in a product design. The method prescribes a very detailed procedure method called “attacking the negatives” to rectify

flaws that make a product more competitive. We think that negatives are to competitive product design as impedances are to fluent implementations.

The fourth source of inspiration is Lean Thinking [7], [8]. The core idea is that waste is the enemy of enterprise, competitiveness and profit, and that its systematic elimination is necessary. This was discussed in [9] in this volume. We can think of this in the following way: waste is to lean as impedance is to fluency.

Hence, directing our attention to the particulars of *impedance* that drive dysplementation and especially to methods of attacking them would be a meaningful approach to eliminate dysplementation gaps. To that end, we set the following goals and objectives:

Goals and Objectives Statement

to	close the strategy-to-implementation gap
by	<ul style="list-style-type: none">• considering the strategy-to-implementation gap as an organizational disease• attacking the pathogens that create strategy-to-implementation disease• developing practical and useful methods, tools, and instruments
using	<p>First principles, useful and practical findings from:</p> <ul style="list-style-type: none">• sociotechnical theory• organizational management• knowledge from expert practice, and the literature

Our search for impedance is not ad hoc or random. We want to identify factors that cause impedance in a systematic and orderly fashion. We do so by using the US Navy as an example [10]. We consider the US Navy as a convincing starting point, for it meets the five rules we stipulated for our goals. By abduction, we will find the dominant factors that define impedance and cause dysplementation.

Goals and Objectives Example – US Navy

The US Navy is a unique enterprise. Its magnificent achievements in warfare, and its role in preserving the peace and defending moral values, are exceptional. It is undefeated since it was created. It produced Alfred Thayer Mahan, one of the most prescient naval and geopolitical strategists in modern times. He is the peer of Sun Tzu and Carl von Clausewitz of land warfare. The US Navy documents its mission and goals as follows:

Goals of US Navy

to	"... preparing [sic] for the future by rebalancing our defense efforts in a period of fiscal constraint.
by	<ul style="list-style-type: none">• protect the homeland, to deter and defeat attacks on the United States• build security globally, to preserve regional stability, deter adversaries, support allies and partners, and cooperate with others ...• project power and win decisively, to defeat aggression, disrupt and terrorist networks, and• provide humanitarian assistance ..."• winning decisively (US Navy (2016)
using	submarines, carriers, surface combatants, amphibious, and support ships
subject to	US Congressional funding and fiscal rules the needs of national security .

The US Congress uses three factors to determine how well the US Navy is fulfilling its mandate. "Assessment of US Navy: **Capacity, Capability and Readiness**" (2026).

- *Capacity* - measured by the number of ships.
- *Capability* - measure of naval strength relative to other nations, friends and adversaries. This requires comparisons of platforms, weapons, operational concepts, training, education, readiness and other factors.
- *Readiness* – measure to fulfill the Navy’s mandate “to be where it matters, when it matters”, with what matters. This measure is even more complicated than capacity, for one has to consider the age of the platforms, the quality of maintenance, the proficiency of personnel, the intensity and length of potential deployments, and so on.

Deficiencies in capacity, capability and readiness form the basis of impedances in the US Naval strategy

Impedance – Our perspective

We adopt and adapt the US Navy’s three factors for organizing principles for strategy-to-implementation impedance. A summary is shown in the table on the next page. **We define impedance as particular deficiencies in capacity, capability, and readiness, which drive dysplementations.** (Recall that the impedance of sloppy goals and objectives has been discussed elsewhere in this volume [3]).

Capacity is the ensemble of resources that can be brought to bear on a strategy implementation. These resources are tangible or intangible. Tangible means they are physical assets; say, Ford Motor Company’s repertoire of vehicles, or Intel’s repertoire of chips. People are also tangible

resources for they can be counted, identified, and organized. Intangible resources are non-physical assets; such as the Lean Manufacturing consulting methodology, industry knowledge and experience, know-how on operating machinery and competence on business process rollout. Data and information are also intangible. The state of any resource is an important property that either ameliorates or intensifies capacity impedance.

Capability as the proficiency with which the social system uses the existing and available capacity. Clearly even the most skilled and proficient organization is dysfunctional if it has deficient capacity and defective supporting sociotechnical infrastructures. Capability has to be evaluated from four perspectives. Proficiency as measured internally by the organization itself. As measured versus their current competitors, future hypothetical competitors, or synthetically constructed adversaries, under current and future expected uncertainty conditions. As measured considering the organizations' experience in implementation and dysplementations with other strategies. Clearly, the rookie organization will have a reduced capability multiplier over a group of seasoned veterans. One important caveat applies to experience; we must value experience in which learning has taken place versus experience in which little or no new learning has taken place. The latter case is the "rotating bald tires" syndrome.

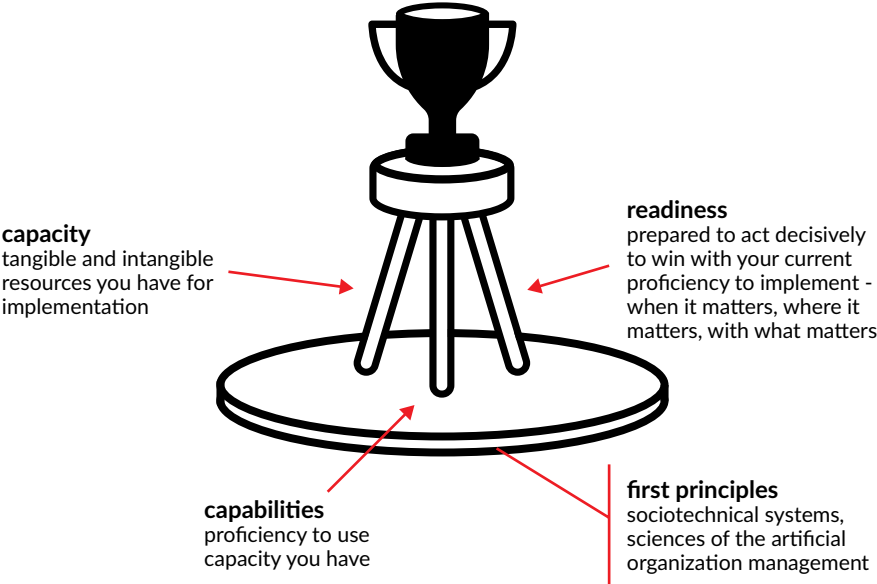
We think of **readiness** as the extent to which an organization is completely prepared to mobilize with little or no additional capacity or capability to implement a strategy. Deficient readiness is the opposite condition. This requirement was vividly illustrated in the New York Times Magazine of 4 February 2018 devoted to the American athletes who were going to compete in the Pyeongyang Winter Olympics. All the athletes have magnificent physiques (capability), and they have all competed and won world-class events (capability). Particularly striking was their unremitting and intense training under a variety of conditions. They were preparing themselves prior to going to Korea (readiness). We think there are five factors to readiness: basis, phases, places, spaces, and faces. Basis deal with capacity and capability; phases deal with quick entry during all stages of implementation; places deal with location; spaces deal with technology, industry, and markets; faces deal with leadership's decisiveness and sense of urgency.

We must draw a distinction between capacity and capability. Capacity is the inputs to sociotechnical processes that that will generate the intended output. The output is never automatic like a ball rolling downhill. To produce a sociotechnical output requires a mechanism m , such that output $y=m(x)$ will be produced using input x . Clearly, there are a variety of ways for a sociotechnical system to design the desired function m . The different ways by which y can be generated are called *mechanisms*. Some mechanisms are more effective than others. For example, a senior executive can meet a schedule by fear or by positive incentives that will enthruse a workforce to meet a schedule. Capacity is the independent variable, capability is the proficiency by which the capacity is being deployed. Therefore, conflating capacity and capability is incorrect.

These ideas are summarized first with a graphic illustration and followed by an explanatory table on the next page.

Capacity, Capability, Readiness

Fluent Implementation



To close the strategy-to-implementation gap, attack the deficiencies in capacity, capability, and readiness factors in the organization's sociotechnical systems. It is assumed that correct goals and objectives are correct

Given this graphic illustration of the mental model of impedances as deficiencies in capacity, capability, and readiness, we are now ready to specify the details of these deficiencies.

Impedance Taxonomy - Categories of Deficiencies

	capacity deficiencies	capability deficiencies	readiness deficiencies
focus	tangible resources intangible resources people	proficiency of users in use of resources quality of resources	decisive decision making immediate action
key question	ready for use? quantity and quality of resources	proficiency in use? ready to use resources? able to use resources?	make sense to use? urgent to act?
deficiency parameters	quantity reliability, availability, serviceability operability costs	proficiency experience – depth & extent learning and unlearning scan the environment	sensemaking decisiveness
scope	applies to all strategy-to-implementations	S/T practices, methods, processes, tools S/T hard and soft infrastructures	specific situation and conditions
theoretical foundations	S/T supply chain management	S/T sciences problem domain specific sciences	sensemaking
policy focus	power relative to competitors reserves	internal and external strategic alignments satisficing	fluent implementation life-cycle processes and procedures commitments & dependencies solid
risks and caveats	costs old/wrong thinking solving the wrong problem state-of-the-art bias	legacy culture, capacity learning & unlearning outside knowledge complexity risk & uncertainty bias	leadership quality fear of uncertainty and doubt (FUD) HIPPO's* judgment surprises bias
judges	theoreticians scholars	line executives and line managers	decision makers

* Highest Paid Person in the Organization (HIPPO)

Impedance – Another example

Consider a bank with a billion Euros in assets. This bank is registered as a retail and investment bank in dozens of countries worldwide. It boasts a leading-edge IT infrastructure. The size of its workforce of finance professionals and customer service personnel would, without exaggeration, rival armed forces of a medium size country. They have also acquired some of the best intellectual capital from leading research centers and entrepreneurial outfits. In terms of tangible assets and intangible assets this bank is used as a benchmark in their region. Its **capacity is second to none**. This bank, however, suffers from two key weaknesses. Its emphasis on leading technology, relentless acquisitions of hardware, incessant building of communication networks, and promiscuous purchase of intellectual assets, all makes training the workforce a challenge. Their proficiency to operate and service their systems, applications and maintain a high level of customer service are not equal to the technology they have deployed. Legacy capacity further encumbers the bank's ability to sustain high performance. **Capabilities are inferior**.

The executives are eager and incented to accumulate capacity and make their workforce proficient. However, middle managers, faced with rapid acquisitions and disruptive technologies, are less eager to jettison much of what they know for another wave and deluge of tangible and intangible assets, to learn new technology, methods and tools while simultaneously bringing online new business processes. This is exacerbated by the bank's push to foreign countries. Expats do not know the local language and its culture. Locals don't have the same work style that expats expect. **Readiness to implement its strategy is flawed**.

By induction, significant implications follow. *First*, capacity and capabilities are distinct concepts. Regrettably, conflation seems the rule. *Second*, capacity, capabilities, and readiness, though orthogonal concepts, interact *systemically* in a way that influences both intended output as well as sociotechnical performance. *Third*, deficiencies in capacity, capabilities, and readiness *propagate* and *stack-up* throughout implementation to negatively influence the intended outputs and the performance of the sociotechnical implementation mechanisms. These deficiencies propagate like sand in the lubricant of the implementation mechanisms. The interactions of these deficiencies produce dysfunctional interactions between the capacity, capabilities, and readiness space. We think of these deficiencies as the causes that produce and intensify the strategy-to-implementation gap. They are the pathogens that cause the strategy disease of *dysplementation*.

Summary

To analyze the factors that can predict unsatisfactory and failed implementations, we introduced the following new ideas:

- **Implementation fluency:** Fluency is the property of an implementation that can be characterized by a minimal number of implementation gaps. This means that a strategy implementation is effective and free of dysfunctional surprises. The behavior of the sociotechnical systems satisfies [1], [2].
- **Strategy dysplementation:** Dysplementation is the absence of fluency. We argued that the root causes of dysplementation are like diseases that ruin our health and make us ill. We used this as a metaphor to explain the causes of dysplementation. When we are sick, we want to know the disease that makes us unwell and eliminate it. Similarly, for strategy-to-implementation, we do not emphasize best practices, tools, methods, processes, and the like, which research shows/claims to be effective. In contrast, we concentrate on how to eliminate diseases of implementation and their causes. This is illustrated with a process flow chart on the next page.
- **Impedance.** Impedances are the diseases that drive dysplementation. Our task is to understand the causes, nature, and specific effects of impedances. And by identifying instances and classes of impedance, we can *attack* them and reduce the occurrences of dysplementation.
- **Typology of impedances.** We identify four classes of impedances: 1) sloppy goals and objectives, 2) deficient *capacity*, 3) deficient *capability*, and 4) deficient *readiness*. Capacity deals with resources and infrastructures required to implement a strategy. Capability deals with proficiency of the sociotechnical systems to use that capacity. Readiness deals with the preparedness to implement when it is needed, where it is needed, and with what is needed.

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Endnotes

- ¹ The Zeithamel gap model has since gone through several improvements and refinements. The most recent is the one by Tang et al. (2018), which has been submitted for publication.

8

Patterns of Strategy and the Execution Gap

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In this paper we argue that the Patterns of Strategy (PoS) approach [1] addresses the 'strategy execution gap' in three ways. First, a systemic paradigm provides an understanding both of why conventional strategy fails so often and how this undermines implementation. Second, speeding up the strategic decision-action cycle reduces the chances of the environment changing between conception and execution. Thirdly, PoS helps execution by developing strategy as a series of maneuvers which makes it easier to: plan execution, to specify the organizational changes needed for execution, and develop metrics that show if the strategy is working.

Current approaches to strategy development

The problems of failure of conventional strategy approaches are well documented with a failure rate estimated at between 70% and 98% [2], [3], [4], [5], [6], [7], [8], [9].

Much of the debate within the strategy community has focused on problems of execution [10], [11], [12]. The hypothesis that execution is the key problem is superficially plausible, but assumes you can separate strategy as distinct from execution. This follows a Cartesian logic separating mind and matter, which in the organizational domain is a separation of strategy formulation (thought) from organizational reality (matter). We argue that from a systemic viewpoint this conjecture is problematic both philosophically and practically. Philosophically it's problematic because strategy formulation is something done by the organization and should take into account both the realities of organizational capability and business environment. So the basic premise is both flawed and dangerous because it leads teams to treat strategy as something abstracted from these realities and the more abstracted strategy is, the less likely it is to be actionable in the real world. More practically there is no way to determine the extent to which execution problems are caused by underlying problems with the strategy. Empirically, the execution argument is difficult because the rate of change in the strategic environment shows that lots of change is happening. So, whilst it is tempting for strategists to dismiss failure as a problem of execution rather than of strategy itself, this argument is only tenable if the fundamentals of strategy are sound. We argue that from a systems and game theoretic perspective [13], [14], [15], [16], some basic assumptions in conventional strategy are flawed to the extent that we wouldn't expect conventional strategy to work other than in the minority of cases reported.

Systemic vs. conventional views of strategy development

There are six key differences between conventional and systemic approaches to strategy development and execution.

1. A focus on relationships

Conventional approaches focus on either the organization and its capabilities, or the environment through a market-based approach, rather than on the nature and dynamics of the strategic fit between them. In systems, the focus is on the *relationship* between the organization and its environment. Every organization sits in an ecosystem of relationships in which it is affected by, and affects, other actors in its environment [17]. Those typically include a market, one or more key competitors, one or more partners, or a regulator. The organization belongs to an ecosystem and, from this perspective, strategy is about managing the organization's set of relationships, so they deliver what the organization wants.

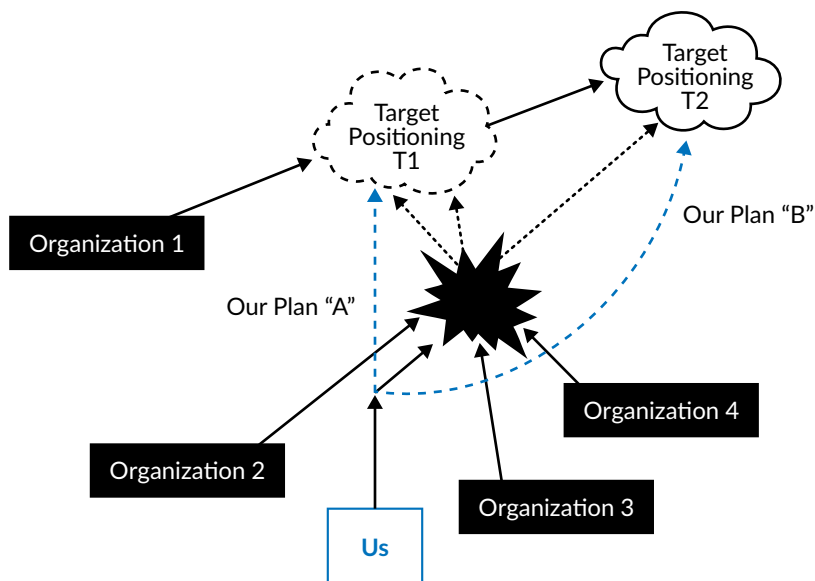
It's the nature of each relationship that determines the extent to which the organization achieves strategic fit and so the success or failure of the organization. We argue that the purpose of strategy is to achieve a strategic fit in which the organization can thrive.

As soon as relationships are examined, relativity between the actors becomes crucial. An organization could increase its efficiency by 20% and feel pretty proud but that measure must be seen in context: if a peer competitor can increase its efficiency by 25% then the organization is still losing. Focusing on relationships prevents the habit of looking at an organizational measure in isolation and instead ensures it is assessed in context, and only then making an interpretation of its significance.

The dynamics of each relationship are significant too. Any relationship has its own dynamic and direction and unless one of the two actors in the relationship (or the environment itself) intervenes, the relationship will continue on its default track, as these relationships are carried by momentum.

2. Multiple actors

Conventional strategy treats other organizations as abstract forces, if it factors them in at all, treating strategy as though the organization is operating on a blank canvas. But any organization typically has several key strategic relationships. All these other actors are moving strategically and their actions can impede the organization's strategy. It's vital to consider thoroughly what their direction and speed of travel might be, and what impact that could have.



3. Time

There is almost no time dimension in conventional strategy approaches despite the prevalence of windows of opportunity or time-critical threats in strategic situations. In most situations, an organization needs to be able to change as fast as its environment is changing, and in most competitive situations, it needs to be able to change faster than the competition too.

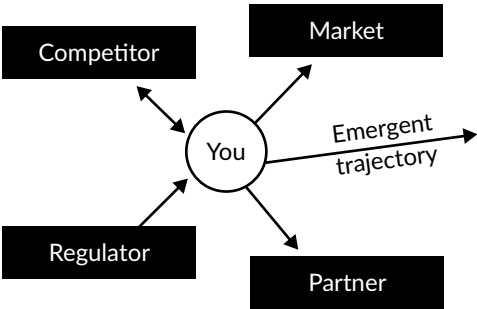
Using time strategically requires an understanding of how fast an organization can move or change, relative to other actors in the ecosystem. Having only one speed seriously curtails the strategic options available to an organization. Gaining an understanding of the significant differences in speed is important. These could be in operational cycle time or decision-action cycle time. Operational cycle time is the time it takes to complete a core operational process (think of the strategic impact on the automotive industry of the Toyota Production System which had at its heart dramatic shifts in operational cycle time). Decision-action cycle time [18], [19], is the time it takes to gather decision inputs, take and then enact a decision. Some organizations can put the brakes on their own performance simply because their decision-action cycle times aren't appropriate for the rate of change in the environment. Time is also important in assessment of strategic risk, those risks that could hole the organization below the waterline: how fast is this potential issue travelling towards it, how soon could it hit, how long is there left to get prepared?

4. Collaboration

Conventional strategy is predicated on an assumption of competition, [20] and most organizations do compete somewhere. But *all* organizations also collaborate, yet most conventional approaches only really deal with the competitive relationships. Large parts of an ecosystem depend heavily on collaboration, so it's important to have a strategy approach that develops strategy for collaboration. Many strategic situations demand both competition and collaboration, sometimes simultaneously and sometimes between the same actors, so approaches that only deal with competition miss half the picture.

5. Emergence

Conventional strategy generally follows a mechanistic model. Again, this follows the underlying Cartesian logic and an assumption of linear cause and effect – that the strategy causes the execution. Mintzberg stands out with his emphasis on emergent strategy, [21], [22], [23], the *actual* strategy that emerges from the decisions and actions of an organization, as contrasted with the strategic plans that rarely get implemented. Emergence is a systems theoretic concept [14], [16], [17], and systems approaches explain emergence through modeling relationships within the system and their dynamics through time. If an organization's strategic direction is heavily driven by the nature and direction of its relationships, then emergent strategy is an inevitable consequence. It explains that 70-90+ % failure rate of strategies that ignore the impact of these relationships: their effects can totally overwhelm the organization's strategic plans. Each relationship exerts pressure or tension on the organization to move in particular directions, and the overall strategic direction is the product of these. So, when Mintzberg talks about emergent strategy, this is how it emerges, and it is the forces, pressures and tensions of the organization's relationships that drive its actual strategic direction. The fundamental difference is to recognize that the causal linkage between strategy and execution is not linear and is not one directional. From a systems theoretic point of view, there is no reason to suppose that strategy drives execution any more than execution drives strategy, and following Ashby's Law of Requisite Variety we would normally expect execution to dominate strategy more often than the reverse.



6. Action

Conventional approaches treat strategy as a mental construct, a document or plan. This is necessary but insufficient – strategy is what is realized, what actually happens with real people and real organizations, which actors take which decisions and act in which ways and with what impact, as Mintzberg described: “*strategy is a pattern in a stream of actions*” [24], strategy is what actually happens when organizations act and change things for other organizations in their strategic arena. The PoS approach treats strategy as a clear and specific sequence of maneuvers which each actor executes, where a maneuver changes the nature or dynamics of the relationships.

Together, these six factors go a long way to explain the failure rate of strategy independent of execution problems, as strategic plans are destabilized by the unanticipated maneuvers of other actors operating at different rates in the same strategic space driving emergent outcomes irrespective of plans.

Although we say that from a systems viewpoint we’d expect conventional strategy to fail about as often as the evidence suggests it does, we have made this as a theoretical argument. However, in practice, we see the six issues discussed above playing out repeatedly when working with management teams on strategy. PoS has been used with over 70 organizations from private, public and third sector over the last five years. It models strategy as sets of strategic relationships where each party in the relationship drives changes in the other. In every case, management teams can see that their relationships have a natural trajectory driven by the differentials between the actors in them and that their organization’s emergent strategic direction is a product of the relationships with key actors in its strategic arena. We consistently find situations where: understanding the nature of strategic relationships reveals the natural default trajectory – the emergent strategic direction if nothing is changed; where there is a need to deal with both competition and collaboration, often in the same relationship; where anticipating the maneuvers of each actor reveals opportunities to intervene strategically to change the nature or dynamic of the relationship and achieve a better strategic fit; and where the criticality of time is shown to be just as important for business strategy as it is in military strategy. Developing strategy in this way has another unexpected benefit: it’s viscerally real to the participants modeling their relationships. They look at their relationships, and the nature and dynamics of those relationships, and see their world laid out in front of them. And because it’s real, their level of commitment to both the modeling process and its conclusions is very high; it’s not just a thought experiment, it can be a matter of survival. This again speaks to the problem of the Cartesian separation – tackling strategy in this way reduces the gap between the thought process of formulating strategy and the viscerally emotional reality experienced by management teams.

We argue that this systemic approach provides a much sounder base for developing strategy. It’s one where the effect of the organization’s actions on others, and their actions on the organization, can be modeled to show default emergent strategic direction and options for altering that to advantage.

Strategy Cadence

Conventional strategy tends to run on an annual cycle locked to the financial year. Crises can erupt in much shorter timescales and require rapid strategic responses, sometimes within days. Any approach that can't keep pace with the rate of change in the environment is potentially fatal. One advantage of PoS is that it is a significantly faster process than conventional strategy. The board of a finance company that worked with a Big Four consultancy on strategy for 18 months said they had got further and deeper in three hours with PoS than in the previous 18 months. They focused on three relationships, and in this particular situation the relationships themselves were interdependent, so it was key to understand the whole system and the role each actor could take to develop their strategy.

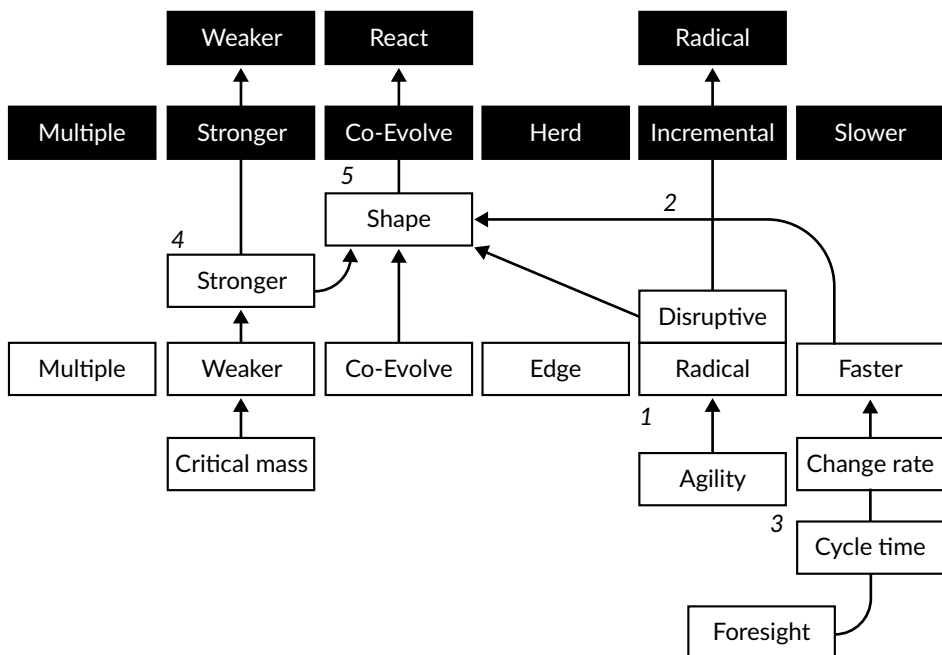
The longer a strategy takes, the greater the chance another actor's strategy will render your strategy irrelevant. The shorter the strategic cycle, the greater the chance of it being implemented before the world shifts. Modeling strategic relationships systemically is fast, so it is possible to develop strategy quickly, exploring several options at a high level in a day. This improves the quality of decision-making – the best strategy comes from exploring multiple options and testing them for impact and do-ability. If strategy development is slow, then only one or perhaps two potential strategies can be developed and explored in terms of its requirements and implications. One client in a very unstable environment asked us to help them generate some alternatives. In an hour, we had 25 viable options. This was possible because we have used pattern language to observe and codify 100 commonly used strategy patterns [1], and these can accelerate the strategy process even further. This means that it is possible to develop and review strategy often, simply because it is so fast. It can form part of the operating rhythm of the leadership team, or an organization can revisit its strategy if it detects a change in its environment, or if one of the other actors makes a move, or if one of the strategy delivery metrics isn't met. In looking at the strategy execution gap, it is seductively easy to focus on either side of the gap, either the strategy development, or the strategy execution. But the nature of the relationship between the two is also critical. Often this is seen as linear, as execution follows formulation, and whilst this seems obvious it leads us to ignore those cases where the reverse is true, to ignore emergent strategy where the “pattern of actions” (execution) drives the actual strategy and very often also drives the thinking in the organization, with managers post-rationalizing the strategy they ended up following as having been deliberate. By developing the relationship between formulation and execution as a two-way process, not only is strategy formulation better grounded in the reality of what the organization is actually capable of but also, counterintuitively, the whole of the decision-action cycle is speeded up. Part of crossing the strategy execution gap is to enable two-way discussion of proposed strategies as early as possible in the strategy process, and to enable a continuous two-way dialogue and evolution over time. It's about seeing the development and execution as an iterative, continuously evolving strategy process. Drawing development and execution together aligns the thinking and mental models of the developers and implementers of strategy, so that the strategy is understood by both to be actionable. In practice, this can lead to execution commencing immediately and we have repeatedly seen teams start execution

literally within minutes of formulation. Re-engineering the relationship between formulation and execution also makes it much easier for the executors to feedback on the measures as they are captured – there is an active and ongoing strategy process to receive that feedback and adjust strategy accordingly.

Using PoS, the strategy discussion moves between what might be desirable strategically, and whether and how fast it can be done. This is the three-way interaction between strategy development, understanding the organization's capabilities, and the planning of strategy execution. Typically, the discussion is about considering what organization and capabilities might be needed for a particular strategy, and simultaneously considering what strategy options are possible or easy, given the organization and capabilities available, and the rate at which the organization is capable of changing. Iterating between these three perspectives is crucial to draw strategy development and strategy execution closer together. In terms of planning for execution, this fast iteration and consideration of many options is important, because it gives both the strategy development team and the execution team the confidence that the selected strategy option is realistically deliverable by the organization. This is in stark contrast to many conventional strategy approaches where strategy is conceived in complete isolation from the harsh realities of the organization (quite literally, sometimes, if the strategy team go off to a remote location to do it, or the strategy is developed by an external third party), and so the divorce between strategy development and strategy execution is built into the conventional process.

Strategy as a sequence of Maneuvers

The third way in which PoS helps with the execution gap is by developing strategy as a sequence of maneuvers that provide the execution team with a clear and well-articulated set of shifts in organization capability, along with defined output and outcome metrics to assess strategy delivery. Each maneuver changes the nature or dynamics of the relationship, affecting one or both actors in it. So the development of maneuvers has precision: not just a vague “be agile”, but instead: “be *this* fast, in *that* business operation in order to have *this* effect” and have “x amount of resource deployed from Operation A to Operation B within y days.” It's totally clear to the execution team what changes in capability are required, by how much and by when [25], [26]. Maneuvers have a sequence and timing, so the strategy directly and easily generates the execution plan as a sequence of changes in capability, and when they need to be delivered to achieve the strategic intent. The output metrics on capability change give early validation of the strategic option that has been chosen, testing whether the organization is actually capable of delivering the strategy, given the degree and rate of change required. The outcome metrics give feedback on whether the nature and dynamics of the relationship have actually changed as planned. Many strategies only have metrics related to the organization itself, yet clearly it's important to also have metrics related to the environment and other actors beyond the organizational boundary.



“

The organization at large can only execute strategy when they understand it and understand it in detail and with precision

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A frequent constraint on effective strategy execution is the quality by which the strategy is communicated to the execution team, and to the organization at large. As described above, it's not communication to the execution team: they are an intrinsic part of strategy development, and the iterative style of working outlined above ensures that the execution team deeply understand the strategy. The organization at large can only execute strategy when they understand it and understand it in detail and with precision. Reverting to a previous example, then “*being more agile*” doesn't help. But being “*this fast, in that business operation*” sets a clear expectation to affected parts of the organization, and other parts of the communication confirm which parts of the organization will stay stable [27]. Describing strategy maneuver by maneuver makes communication very straightforward, by describing how the nature and dynamics of the relationship should change and why that's important. This Why-What-How communication structure means the key thrusts of a strategy can be articulated quickly and easily, usually on one page. Shortness matters: we worked with one organization that had eight strategic themes, and each theme had a 30-40-page document in a very small font. None of the senior leaders could articulate what their strategy was. This was replaced with a one-page Why-What-How communication, which all the organization knew and understood and could use as a guiding

touchstone whenever they needed to make decisions. That makes it much more likely that the strategy will be executed as intended across the organization and across the execution gap.

We'll illustrate the specificity of maneuvers using a case that describes the strategic context and then illustrates the strategic maneuvers, the capability shifts required to deliver them, and the metrics to monitor their execution. The metrics are a mixture of outputs and outcomes.

The case involves an IT & informatics organization supplying the commercial arm of a large multinational pharmaceuticals company. The commercial function had had a prolonged period of strong revenues, and that in turn had given a good deal of stability to the informatics group. But the commercial function had come under intense pressure, on two fronts simultaneously. A number of products were coming off patent, which generally causes a huge drop in profit, needing robust defense, and a number of new products were being launched, needing marketing excellence and faster launch speed.

The initial position wasn't strong for the informatics group. With the previous environmental stability, they hadn't invested sufficiently in gathering intelligence about the changes in it. Their pattern of investment was into a small number of large applications to support core operations, with a complicated governance process and slow delivery. Their only way of doing application development was waterfall, or sequential development from conception to deployment and maintenance.

Strategically, the most important thing was to address their slowness: for the informatics group to be really valued by its commercial customer, it needed rapid and innovative delivery of a new class of solutions, adding decision support solutions to those already provided to enable core business processes. There was also the potential to shift from supporting "business as usual" to assisting the transformation of the commercial function. If the informatics group could pull this off, they could move from a reactive supplier role to a genuinely strategic partner role in which they could help to shape their customer's strategy. This is the sequence of maneuvers, capability shifts and metrics we developed with them, with identifying characteristics altered to protect their confidentiality – this is a strategy in progress.

Maneuver 1: Improve foresight on both business challenges and IT trends. Capability shift: build a team from staff with boundary spanning roles, make gathering insights a key part of the role and have a process for synthesizing then disseminating the intelligence. Metric: ability to predict and prepare for the most significant changes in business environment and ability to generate ideas of where technology could support forthcoming business challenges.

Maneuver 2: Adopt new practices including agile and design thinking. Capability shift: add agile development progressively to all development teams except ERP support team. Metric: reduced elapsed time from concept to solution in use, for a defined subset of their application development portfolio, from years to weeks.

Maneuver 3: Reset the portfolio process to divert resources into strategic initiatives. Capability shift: Alter the portfolio process, altering resource allocation developing a two-speed portfolio process, one speed to handle business as usual and a rapid response to handle strategic solutions. Metric: Application investment decisions taken quickly when required, and the agreed amount of resource is being reallocated to strategic requests.

Maneuver 4: Develop ability to do disruptive innovation as well as incremental. Capability shift: start running small disruptive innovation projects to familiarize informatics and commercial staff with that way of thinking and working, and then focus in on strategically important disruptions. Metric: increased proportion of strategic applications that deliver competitive advantage for the commercial function.

The clarity of the capability shifts meant that the strategy execution was initiated within two weeks of formulation rather than the 6–12 months that they had taken previously, and both the management team and the staff could focus attention on the particular maneuvers that had been assigned to them and could tell from the metrics when these were achieved.

Bridging the execution gap

A systemic approach to strategy development brings very different perspectives. It focuses on relationships between the organization and multiple other actors. It maps out the default emergent strategy, the strategy that actually emerges, which is the product of the pressures and tensions from the relationships with multiple other actors. It recognizes that both competition *and* collaboration go on all the time in any ecosystem, and handles both of those, and situations that can flip from one to the other. PoS purposefully uses time as a way to achieve advantage, and the structure of strategy as a set of maneuvers, each requiring a very specific capability change, directly informs implementation planning and strategy monitoring.

In a fast-moving world, a higher strategy cadence is in itself a competitive advantage. If the organization can sense and interpret environmental signals and move through their strategic decision-action cycle faster than others, then it is axiomatic that the organization has more options and can block options from others.

In terms of the shift from strategy development to strategy execution, good change management capabilities are important, of course, including a range of rates of change, innovation styles and fluidity of resource allocation. But it is possible to have great change management capabilities that have become misaligned with the strategic intent. Looking at both strategy development and strategy execution is necessary but insufficient. The missing link is the ability to run a high-cadence process that dovetails and integrates both development and execution, and which enables constant two-way dialogue between both. The execution team will be the one with interfaces into many parts of the organization, and will be the one that sensitizes the wider organization to be observant of shifts in the wider environment, to monitor metrics or weak

signals of change in the organization's relationships and in other actors. Feedback loops are a key element in system thinking, and these strategic feedback loops to strategy development are vital to keep the strategy on track and realistic in the organization's changing environment.

With PoS, having chosen a strategy from the different options explored, the organization is then able to chart its path as it unfolds. It can assess whether the planned capability shifts are taking place to the degree and at the speed required. It can evaluate which external actors and which organizations are actually affecting the situation and how effective each is being. Perhaps most critically, this approach provides early evidence of the effect of the strategy; it isn't necessary to wait until the end to be able to see the results, thus providing better control and the ability to change the strategy to meet changes in the unfolding situation.

Because conventional strategy fails to take into account what other actors might do that could destabilize us, it rarely works as planned, but the blame for that failure is laid at the door of execution. What we are arguing here is that the responsibility for dealing with that uncertainty in the strategic environment lies with strategy not execution.

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9

The use of narrative to better understand strategy and the associated risks for improved organizational outcomes depending on strategic implementation

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This tool represents a process model considerate of organizational leaders who need to consider, develop and implement strategy initiatives for a complex problem or opportunity (complex being defined as intricate and/or nuanced) with continued and contextualized identification of significant moments of risk. The foundation of this model is based on four premises:

1 – the tendency of successful organizations and their leaders to always be working in the proximate and more distant future simultaneously.

2 – the presumption that humans are biologically inclined to tell stories (narrative) as the format for sharing human understanding. As such, strategy work can be considered a proposal of a new story (narrative) for an organization and its actors.

3 – strategic success is based on the execution of “good stories” that are both coherent and probable and can be determined most aptly through the usage of tools endemic to design thinking and universally communicated as narrative. And, 4 – risk should be assessed based on the proposed narrative (strategy) as it “rings true” and continually be re-evaluated as time and event(s) augment the story’s climaxes, crises, and twists.

Introduction

Today's organizations are forced to meet expectations of continual growth by either one of two ways: Increasing revenue through operational efficiency or creating a new revenue stream by providing new value in a market (1,2). The latter presents a significant challenge to do or become something it has yet to successfully become. More directly, it requires an organization to produce a product or service that is more unique in the market. That can be very difficult at the level of organizational leadership, where the responsibility of both immediate and sustained excellence for the organization resides. It can be argued more often than not that a successful organizational leader has ambidextrous ability (the ability to manage success in the short-term and long-term), which is being defined in this exposition as the ability to produce organizational effectiveness and strategy simultaneously. This poses the question, “why is it so hard?” More specifically, why can't strategic initiatives be operationally effective in and of themselves as they develop new paths to a more valuable position for the organization? Here we present a model focused on the operational efficiency of strategic initiatives that roots itself in human-centered design (HCD) process as applied to internal organizations and customers. While we

will not focus on the details around methodology of an effective HCD process, we will focus on what is important according to the principles of the narrative paradigm that relies on a resilient story for effective communication of value, reason and action for all human beings.

A case for roles

An organization generally has three archetypal capabilities/tendencies at its disposal: Leader, Manager, and Entrepreneur (3), which should generally be considered for the most effective use of talent in strategic initiatives. It goes without saying that each organization will possess their own unique blend in accordance to their identity. Furthermore, leaders, managers, and entrepreneurs (LME) bring different skills and capabilities to their roles within the organization: Leaders tend to focus on change while holding the responsibility for “doing the right things.” (3,13)- Managers tend to focus on current complexity (mostly due to people and their actions) and are responsible for “doing things right.”(3,13) - Entrepreneurs tend to focus on opportunities (3) while holding the responsibility of effectively doing the tasks necessary for an initiative to operate. As organizational leaders green-light strategic initiatives there is a significant risk that comes with the immediate disruption of operational effectiveness for the sake of new operational activities that align with a strategy and expanded goals. How does one know that they'll have the opportunity to reap the prospective value of a new strategy if the initiative never matures to the point of execution and sustained adoption? We're of the belief that the standard for adoption is directly correlated to the operational efficiency of the initiative itself. That begins with the proper communication and collaboration between the archetypal roles executing a strategic initiative. So, in order for strategic initiatives to be operationally effective and more easily implemented, all of the archetypes must each contribute in their particular way but also share empathy as they pursue the initiative. That's simple, but not easy. Often things go wrong because the process is lacking in empathy (understanding and appreciation for general human emotion and behaviors) at the consumer and organizational levels alike. At the organizational level empathy has everything to do with seeing and understanding the value of the initiative and the people it will affect and how it will ultimately implement. That plays out in two major domains: human-centered design (executed by entrepreneurial talent) as well as adequate narrative of the strategic initiative (to be executed and governed by manager and leader talent).

The case for human-centeredness

The key concepts of HCD include a cycle of divergence and convergence in and out of problem/solution space, an ability to empathize, employing generative research, cocreation/participatory design with users, and emphasis on iterative learning through rapid prototyping and experimentation/testing (4,5). Despite any consensus on the core processes and tools involved in design thinking, the task of bringing rigorous empirical testing to assess the outcomes produced by a practice comprised of multiple and diverse stages and tools, and establishing causality with complex

multidimensional outcomes like innovation performance, is a challenging one. To employ HCD with novice human-centered designers in order to develop and implement complex strategy within an organization also seems to include more risk than necessary. Moreover, the process is generally focused solely on the user/consumer. It's our thought that two changes occur for more reliable output with minimized risk and maximized success: 1) the particulars of the process be generalized/reduced for the likes of business managers and leaders while the particulars be the focus of the professionals responsible for driving the process to a successful strategic end; 2) the same processes of empathy, cocreation, and generative research be applied to the organization itself through the actions of the team(s) responsible for the initiative. As Drucker is often quoted as saying, "culture eats strategies for lunch." That tenant holds true within and without the organization. To develop and implement strategy with only the assumption of congruous integration across an organization is a recipe for failure.

Roles as Layers

Image | Thomas Bertling + Byron Wilson

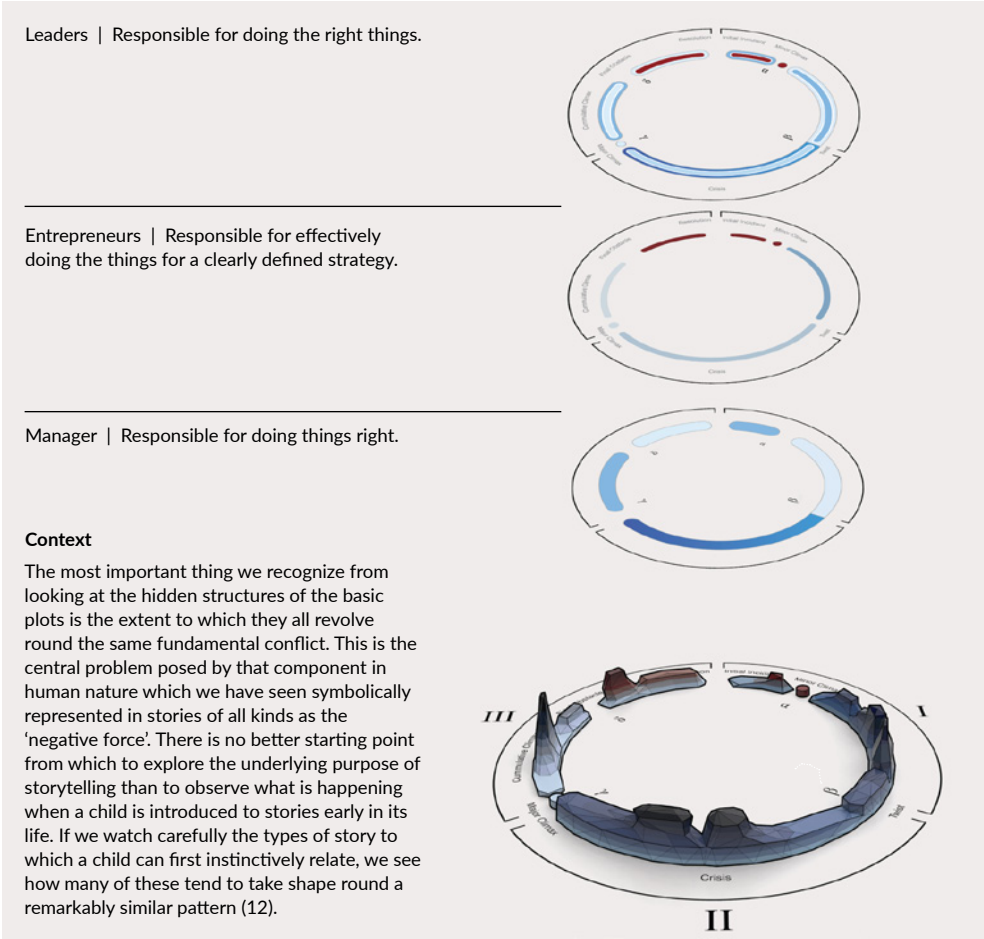


Figure 1. Layers and Context - Visualizations of the different focus and purpose for different roles as well as the "story" to be told and the obstacles that present along the progression.

The case for narrative rationale

The world as we understand it is a set of stories that must be chosen in order for us to live life in a process of continual (re)creation. (6). No matter how strictly a case is argued scientifically, philosophically, or legally – it will always be a story (6,7). “Humans are... storytellers.” The production and practice of are ruled by matters of history, biography, culture, and character. Rationality is determined only by the nature of persons as narrative beings – their inherent awareness of narrative probability (what constitutes a coherent story) and constant habit of testing narrative fidelity (whether or not the stories they experience ring true with stories they know to be true in their lives (7)). So, in the case of developing and implementing strategic initiatives within organizations even the most capable and ambidextrous leader/organization fails to consistently couch their strategic initiatives with narrative as the basis for reason, value and action (5). We argue that success is possible without such consideration. However, it occurs at a reduced rate and the extent of fallout from failure occurs at an increased rate. To avoid this, two things need to occur in concert and as a foundation for strategy implementation and development: 1) characterize all groups identified by HCD as actors and/or narrators with consistent tendencies empathetically defined and set as constants. These tendencies will contribute to inherent values as represented by 2) crafting a story that “rings true” for the organization as well as the user/consumer; the story being a description of (dramatic) actions as may be described in chronological order with key conflicts, main characters, settings and events with a resolution of key conflict(s) by the story’s end. We propose that the development and implementation of strategy be formatted, referenced and assessed on its merits as a success story with intentional moments of risk assessment and opportunity for ad hoc story redesign for narrative rationality.

The case for plot

“The king died and then the queen died,” is a story. “The king died, and then the queen died of grief,” is a plot (8). Both can be considered a narrative yet are not equal in reason or value. If a leader/organization is to adhere to the proposition that development and implementation of strategy is indeed to be couched as a success story, implicit will be the use of plot as a driver of intention. Narrative probability (coherence) refers to the formal features of a story conceived as a discrete sequence of thought and/or action in life or literature; that is, it concerns whether the story coheres, whether or not a story is free of contradiction (7). It is a fair and consistent assumption that the more a story coheres, the easier it will be to accept. In this context of best practices for development and implementation, acceptance of strategy correlates to agreement and provides the foundation for a shared clarity of mission. The other factor contributing to agreement and therefore acceptance will be fidelity. Narrative fidelity concerns the “truth qualities” of a story, the degree to which it accords with logic of good reasons, the soundness of its reasoning and the value of its values. To test soundness, one may, when relevant, employ standards from formal or informal logic. Thus there must be attention to facts, particular patterns of inference and implication (7). More precisely, the notions of narrative probability (coherence) and fidelity constitute the elemental requirements for acceptance of a proposed

story. To forge a most successful story one must include plot within the story as a sort of qualifier. To examine these ideas more robustly, it's worthwhile referring to the psychological research executed on epileptic patients over 50 years ago.

Biological rationale for creating story

The anatomy of the human brain is interesting and complex, in that its makeup is of two discrete anatomical categories; one category referring to function and composition (cerebrum, cerebellum, brain stem), the other category referring to spatial arrangement (left, right hemispheres). For the purposes of this paper, we will apply focus to the brain's operations with regard to hemisphere. Over the years hundreds of experiments have been carried out, and they mainly reveal that the thoughts and perceptions of one hemisphere go on outside the realm of awareness of the other. The left brain is filled with devices that give humans an edge in the animal kingdom. This is the hemisphere that is adept at problem-solving and thinking. While the right brain is better at things like facial recognition, the left brain is crucial for our intelligence agency. After any given action has taken place to affect a human being, the brain computes the event. Only after the brain has adequately processed the action will it become a recognized event. It is then that the illusory "we" (that is, the cognitive mind) becomes aware of it. The brain, particularly the left hemisphere, is built to interpret data the brain has already processed. Yet, according to the work of Drs Michael Gazzinaga and Roger Sperry, there is a special device in the left brain, which is referred to as the interpreter. The interpreter is the last device in the information chain in our brain. It reconstructs the brain events and in doing so makes influential errors of perception, memory, and judgment. The interpreter is tied to our general capacity to see how contiguous events relate to one another and seeks explanation for internal and external events. In the instance that the interpreter cannot produce explanation for an event through means of related memory or reference, it will fabricate an explanation from unrelated memory or reference (9). This became apparent after patients with epilepsy underwent a surgical procedure to disconnect the two hemispheres (left, right) as treatment. Disconnecting the two hemispheres localizes an episodic seizure to the hemisphere in which it begins. During the seizure the other half-brain remains in control of the body. The patient stays conscious and in charge during the attack. The procedure is akin to partitioning a hard disk drive; should one partition fail, the other partition will be unaffected. The split- brain patient appears to have two minds. What the left brain learns and thinks is unknown to the right brain, and vice versa. Since the interpreter resides within the left hemisphere, only the mind associated with the left brain will seek to produce a story based on the processed events of half-brain subjects. It has now been discussed that humans seek to understand and share all matter of experience and cognitive thought as a form of story. In all cases, biological and communicative (narrative coherence and fidelity), humans showcase an inborn need to use narrative to both think and share. What has also been discussed is the direct relationship between the quality of inputs and the quality of narrative output. More precisely, a narrative will certainly be formed to understand and consider the human experience. The only uncertainty will be the quality of the narrative based on the elements that contribute to it. Thus, the narrative is a function of the story, which is a function of plot.

Understanding story with plot as risk

Let us define a plot further, in and of itself. Again, a plot is also a narrative of events, the emphasis falling on causality. The time-sequence is preserved, but the sense of causality overshadows it. Or again: *"The queen died, no one knew why, until it was discovered that it was through grief at the death of the king."* This is a plot with a mystery in it, a form capable of high development. It suspends the time-sequence, it moves as far away from the story as its limitations will allow yet still "rings true" and coheres based on rationality. Consider this example deeply. If it is in a story we say "and then?" If it is in a plot we ask "why?" That is the fundamental difference between these two aspects of the narrative, of which they both originate (8). Relating that notion back to the thesis of this exposition, if a strategic initiative is to be executed well and implemented it must adequately answer "why" across all roles of the organization. We can further understand a plot that divides the story into five parts, and provides function to each part or action. These parts are: exposition (originally called introduction), rising action (rise), climax, falling action (return or fall), and denouement (catastrophe) (11). These basic elements are generally known and understood in their definition. However, considering the context in this explanation they represent the contributing elements of the "why" question by which plot can be defined. And each element is an action that works with other actions to coherently, and with fidelity, move the story forward. So, if in fact the development and implementation of strategy does become formatted, referenced and assessed on its merits as a success story, the places whereby the story can turn, or become unsuccessful, should happen because of the five elements of the plot. As such, the risk associated with any implementation or development of strategy can be found within or connected to the plot. More precisely, risk can be qualified and understood by the deviation of the prescribed narrative versus what actually unfolds. The usefulness of such a thought is based on the idea that there are not any number of plots in the world. Rather the accepted truth is that there exist roughly seven basic plots that can stand alone or be recombined to produce any number of narratives (10). Each one of the plots has a unique set of actors and actions and delivers a different value. The impactfulness is in the knowledge of the elements and the expectation one can reasonably rely upon, based on adequate ability to find the story with the proper fit for the strategic imperative and the culture that will provide a contextual scene to the narrative as it unfolds. Until this point, the benefits of approaching the development and implementation of strategy in the context of narrative has been aligned with human tendency down to the anatomical level and up to the communicative. However, being able to confine the possibilities between the prescriptive narrative and the actual narrative that unfolds puts a new spin on what it is to mitigate risk and how one might go about doing so. The method discussed in this paper, and showcased as the foundation of this tool, links the strategy to be implemented and/or developed with the Human-Centered Design process carried out by organizational entrepreneurs, rightly understood and communicated by managers and designed as well as decided upon by leadership.

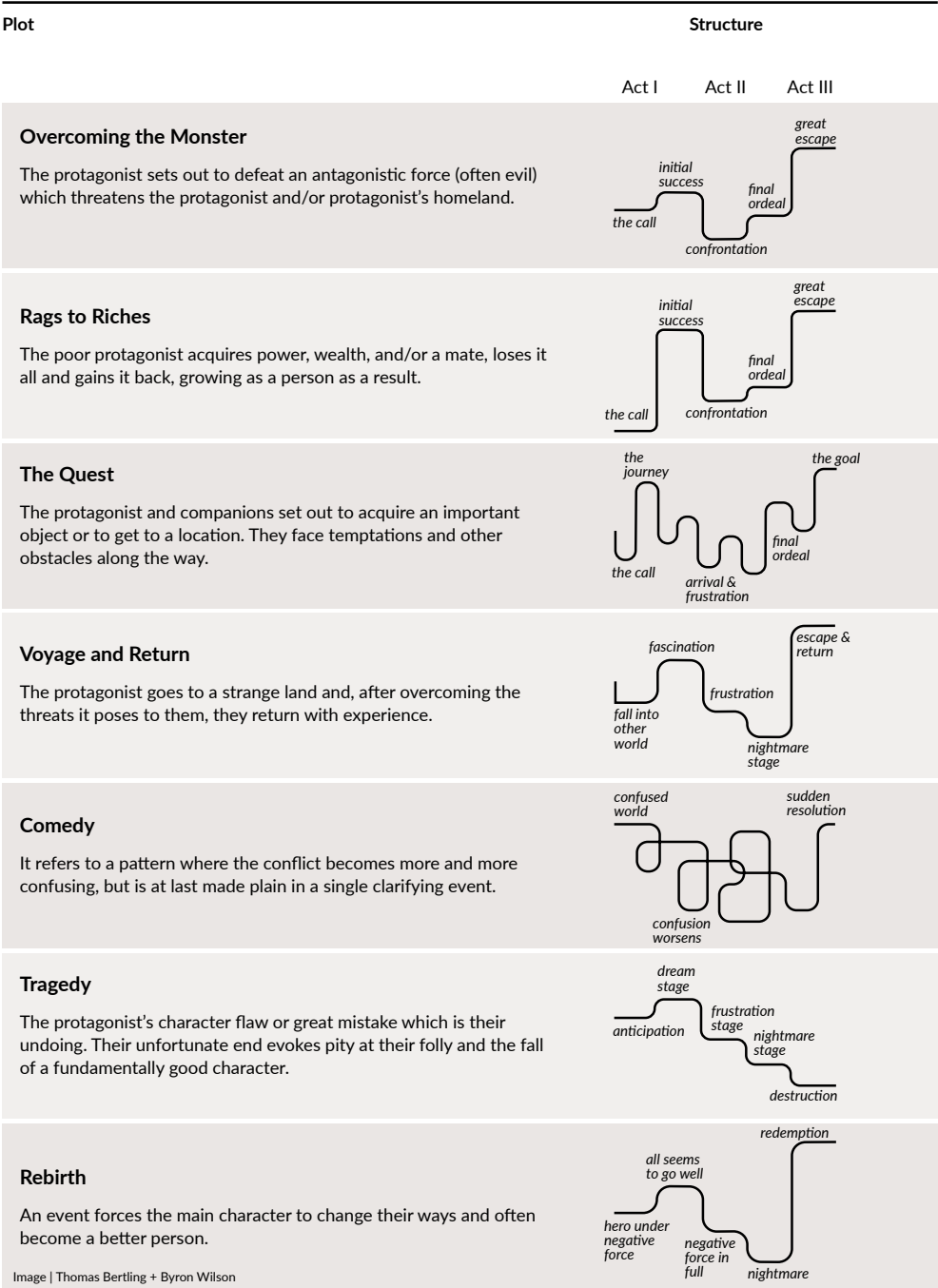
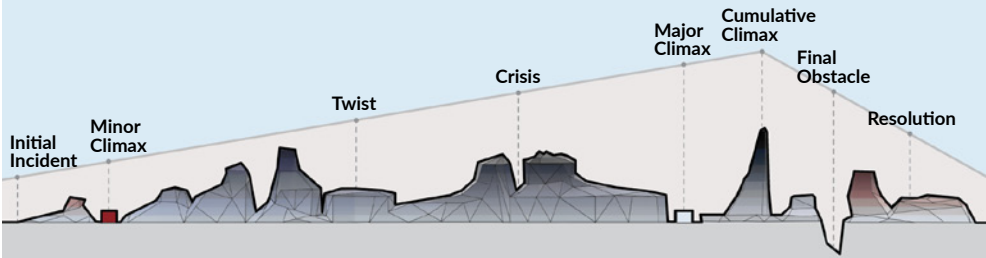


Image | Thomas Bertling + Byron Wilson

Figure 2: 7 Basic Plots - Visualizations of the basic plots as they progress through the 5 stages over the course of 3 acts.



Act Structure

Act I

The 'beginning' of almost any story shows us a hero or heroine who is in some way undeveloped, frustrated or incomplete. This establishing of their unhappy, immature or unfulfilled state sets up the tension needing to be resolved which provides the essence of the story (12).

Act II

The 'middle' of the story shows the hero or heroine sooner or later falling under the shadow of a negative force, the conflict with which constitutes the story's main action. In the types of story we come to early in life this threatening presence is invariably personified as outside the hero or heroine, although later we come to the type of story in which those same dark qualities are shown as lying in the hero or heroine themselves. Through most of the story we see its world divided into an 'upper' realm, where the negative force holds sway, and an 'inferior' realm, where the positive force remains in the shadows (12).

Act III

The 'end' of the story provides its resolution. The action eventually builds to a climax, when the forces making for threat and confusion rise to their highest point of pressure on everyone involved, and this paves the way for the 'reversal' or 'unknotting', the moment when the negative force is overthrown. The nature of the story's ending then depends entirely on how its hero or heroine have aligned themselves to the dark power (12).

Figure 3 - Acts as relates to Plot & Context - Visualizations of the different focus and purpose for different roles as well as the "story" to be told and the obstacles that present along the progression.

Plot

Initial Incident

Story

Empathetic character definition & development. This step involves a purposeful distancing of one's self, from "the normal" in order to produce a distillation of the strategic goal reduced to proposed narrative without and within the organization.

Risk

Maturation of the abstraction period where a decision is made to pursue the narrative story based on the risk associated with the assessed narrative rationale. The forthcoming process (Cycle 1 Fig. 4) will diverge and converge and will need to do so in close synchronization.

Minor Climax

Story

Rising action and initial conflict. This step involves deep and far-reaching research that focuses on science & technology (human capability) concurrent with the psychosocial (human experience). The process will diverge and converge and will need to do so in close synchronization.

Risk

Major risk assessment and point of decision - to pursue the initiative as proposed.

Twist

Story

Rising action continued and secondary conflict around making the decisions and setting the requirements for what needs to be formed or reformed to continue the narrative. The process will diverge and converge and will need to do so in close synchronization.

Risk

Moment of transition from less researching to more realistic consideration based on the applied learnings of Cycle 1. Another chance to augment the narrative. The forthcoming process (Cycle 2 Fig. 4).

Crisis

Risk

Minor risk assessment + Organizational alignment and evaluation of the enacted narrative will diverge and converge and will need to do so in close synchronization.

Major Climax

Story

Rising action continued and secondary conflict around making the decisions and setting the requirements for what needs to be formed or reformed to continue the narrative. The process will diverge and converge and will need to do so in close synchronization.

Risk

Climax around a major decision to continue narrative as previously conceived considering what is now become apparent. Point of full commitment to the narrative. The forthcoming process (Cycle 3 of Fig. 4) will diverge and converge and will need to do so in close synchronization.

Cumulative Climax

Story

Falling action and conflict resolution of the narrative that involves creative and inventive output that meets the standards previously determined and takes prototype form. The form should grow with iteration and definition and begins to be tested. The process will diverge and converge and will need to do so in close synchronization.

Risk

Moment of transition to end development and focus on integration of the concept in situ.

Final Obstacle

Story

Resolution of the narrative in which the final form of the concept has been made tangible and begins the process of introduction into the context where it will reside.

Risk

Minor risk assessment + Organizational alignment and confirmation of the enacted narrative.

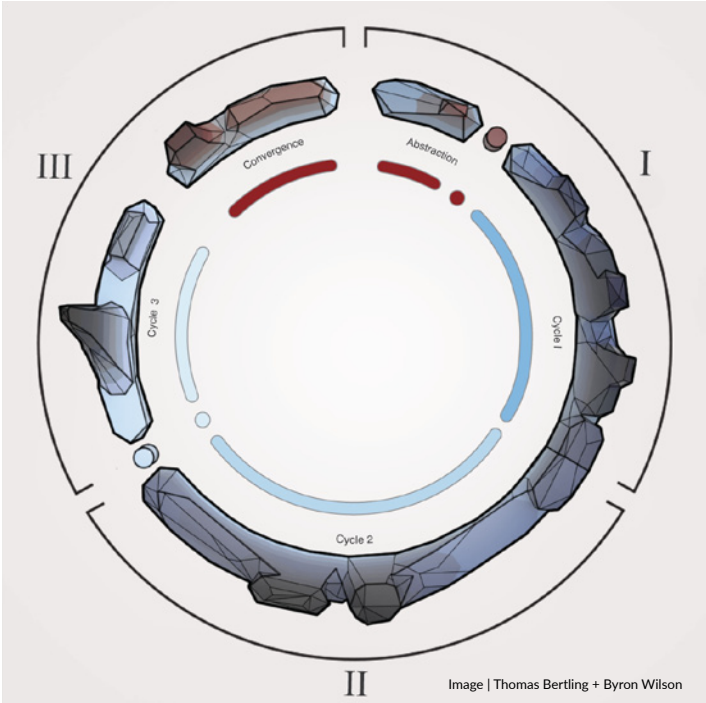


FIGURE 4. PLOT
[Entrepreneur Role]
Plot [Organization
Entrepreneur] Reserved tool
for selection of ideal plot for
each segment of an entire
strategic development or
implementation initiative.

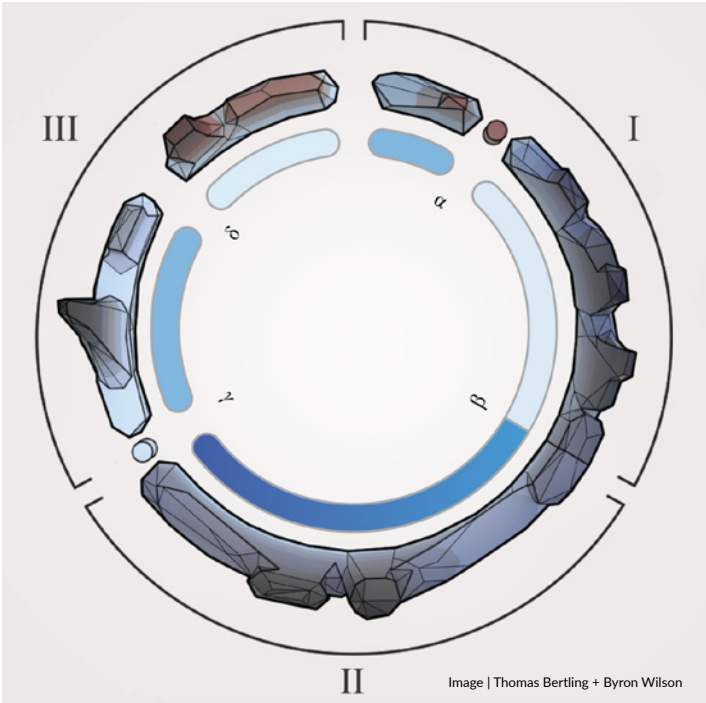
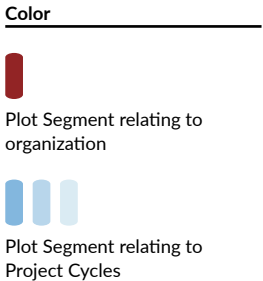


FIGURE 5. STORY
[Manager Role]
Reserved tool for expectation
and estimation of risk for
each segment of an entire
strategic development or
implementation initiative.

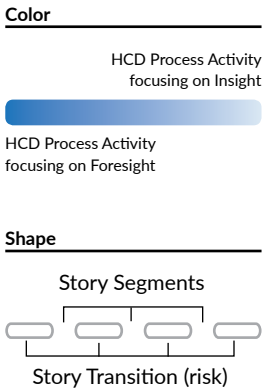


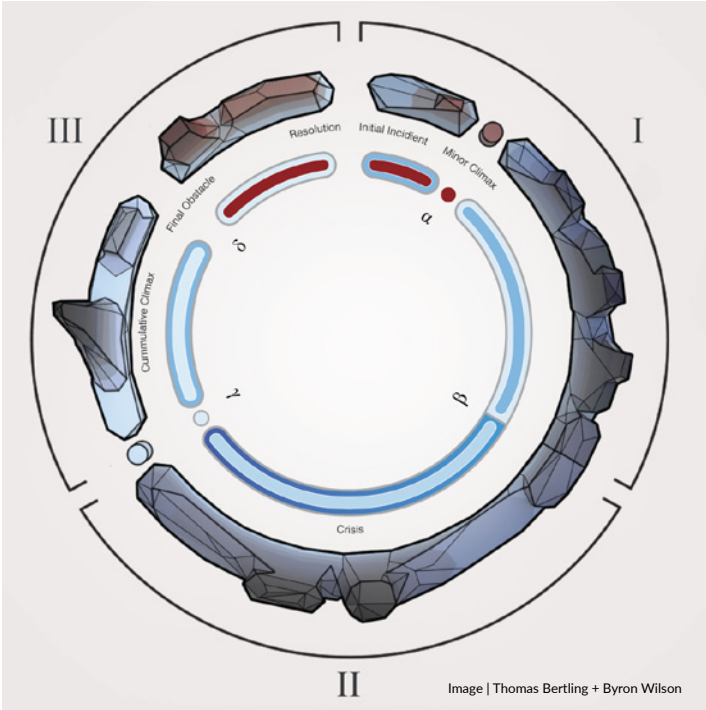
TABLE 1. PLOT [Organization Entrepreneur] This tool should allow for the individual or team actor to establish coherence and fidelity by anticipating the context of the project and focus the HCD process toward best opportunity for success

Act I	Act II	Act III
Abstraction Exposition and empathetic character definition & development. This step involves a purposeful distancing of one's self, from "the normal" in order to produce a distillation of the strategic goal reduced to proposed narrative without and within the organization.	Cycle 2 Rising action continued and secondary conflict around making the decisions and setting the requirements for what needs to be formed or reformed to continue the narrative. The process will diverge and converge and will need to do so in close synchronization.	Cycle 3 Falling action and conflict resolution of the narrative that involves creative and inventive output that meets the standards previously determined and takes prototype form. The form should grow with iteration and definition and begins to be tested. The process will diverge and converge and will need to do so in close synchronization.
Cycle 1 Rising action and initial conflict. This step involves deep and far-reaching research that focuses on science & technology (human capability) concurrent with the psychosocial (human experience). The process will diverge and converge and will need to do so in close synchronization.		Convergence Resolution of the narrative in which the final form of the concept has been made tangible and begins the process of introduction into the context where it will reside.

TABLE 2. STORY [Organization Manager] This tool should allow for more precise management of risk and planning around successful management of a continual divergent and convergent aspects of an HCD process known for being difficult to manage.

Act I	Act II	Act III
[Alpha]	[Beta]	[Gamma]
Maturation of the abstraction period where a decision is made to pursue the narrative story based on the risk associated with the assessed narrative rationale. The forthcoming process (Cycle 1) will diverge and converge and will need to do so in close synchronization.	moment of transition from less researching to more realistic consideration based on the applied learnings of Cycle 1. Another chance to augment the narrative. The forthcoming process (Cycle 2) will diverge and converge and will need to do so in close synchronization.	Climax around a major decision to continue narrative as previously conceived considering what is now become apparent. Point of full commitment to the narrative.
Major risk assessment and point of decision - to pursue the initiative as proposed.	Minor risk assessment + Organizational alignment - evaluation of the enacted narrative.	The forthcoming process (Cycle 3) will diverge and converge and will need to do so in close synchronization.

FIGURE 5. Story continued
[Leader Role]
Layer for steering total
narrative



Color

Plot Segment relating to organization

Plot Segment relating to Project Cycles

HCD Process Activity focusing on Insight

HCD Process Activity focusing on Foresight

Shape

Story Segments

Story Transition (risk)

TABLE 3. PLOT [Leader Role] This tool should allow for the leader of a strategic initiative to understand all obstacles within context of the larger narrative that he or she is steering

Acts	Post Element	Story	Risk
I	Initial Incident	Abstraction - Empathetic character definition & development. This step involves a purposeful distancing of one's self, from "the normal" in order to produce a distillation of the strategic goal reduced to proposed narrative without and within the organization.	[Alpha] - Maturation of the abstraction period where a decision is made to pursue the narrative story based on the risk associated with the assessed narrative rationale. The forthcoming process (Cycle 1) will diverge and converge and will need to do so in close synchronization.
	Minor Climax	Cycle 1 - Rising action and initial conflict. This step involves deep and far-reaching research that focuses on science & technology (human capability) concurrent with the psychosocial (human experience). The process will diverge and converge and will need to do so in close synchronization.	Major risk assessment and point of decision to pursue the initiative as proposed.
II	Twist	Cycle 2 - Rising action continued and secondary conflict around making the decisions and setting the requirements for what needs to be formed or reformed to continue the narrative. The process will diverge and converge and will need to do so in close synchronization.	[Beta] - Moment of transition from less researching to more realistic consideration based on the applied learnings of Cycle 1. Another chance to augment the narrative. The forthcoming process (Cycle 2) will diverge and converge and will need to do so in close synchronization.
	Crisis		Minor risk assessment + Organizational alignment and evaluation of the enacted narrative.
	Major Climax		[Gamma] - Climax around a major decision to continue narrative as previously conceived considering what is now become apparent. Point of full commitment to the narrative. The forthcoming process (Cycle 3) will diverge and converge and will need to do so in close synchronization.
III	Cumulative Climax	Cycle 3 - Falling action and conflict resolution of the narrative that involves creative and inventive output that meets the standards previously determined and takes prototype form. The form should grow with iteration and definition and begins to be tested. The process will diverge and converge and will need to do so in close synchronization.	[Delta] - Moment of transition to end development and focus on integration of the concept in situ.
	Final obstacle	Convergence - Resolution of the narrative in which the final form of the concept has been made tangible and begins the process of introduction into the context where it will reside.	Minor risk assessment + Organizational alignment and confirmation of the enacted narrative.

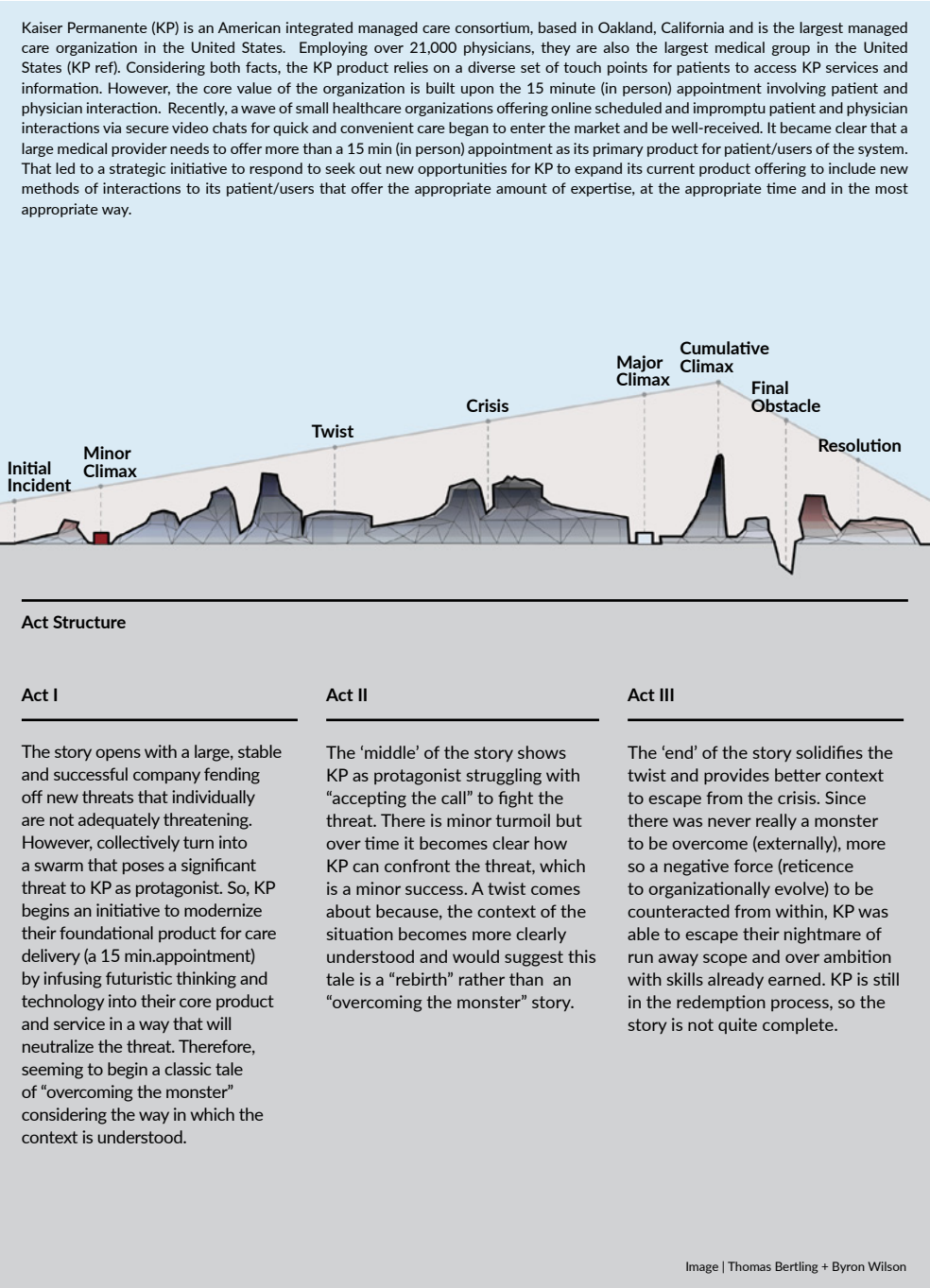


Figure 6 - The Case of Kaiser Permanente - Visualizations of the strategic initiative to include video technology as a medium for a 15 minute appointment with a physician.

Initial Incident

Story

Creating a faster, better, easier way for patients and physicians to interact by expanding the current product offering to offer new methods of interactions to its patient/users that offers the appropriate amount of expertise, at the appropriate time and in the most appropriate way.

Risk

Increased tension within employee community for expanded duties (one more thing to do), negative disruption of a complex operational model, shifting reliance on technology to deliver value rather than a human (losing the human touch).

Minor Climax

Story

Convergent explorations into the conversion of current telephone based support centers for primary care issues into video based support. Divergent explorations into building out a new digital infrastructure to support secure video chats and intelligently route those patient/users seeking care through the use of a smart phone.

Risk

Bringing on a multitude of new partners to assist with the building of a new digital infrastructure different in scale and performance from the current system in place only to be reliant on new relationships to deliver a foundational service to patient/customers. Also, there could reasonably be a drop in quality and performance during the expansion within an industry that is measured by consistency.

Twist

Story

A new focus more on experience design and how to expand both what happens during the time shared between patient/user and KP care provider as much as how the two parties convene and consequently focus more on incremental technology advances to achieve that goal.

Risk

Decreased yet more focused scope of change may not deliver the necessary impact to justify the challenges of expanding the services.

Crisis

Story

Because the strategic initiative extended throughout the entire organization, each region was involved with the initiative and began to act on their own behalf rather than the larger organization with regard to how expansion would manifest because of the strategic initiative.

Major Climax

Story

Internal and external resources for this strategic initiative dwindle as focus shifts back to operational needs and larger external partners go away.

Risk

As the expansion of services becomes more coherent and defined (yet scattered in how it manifests) it becomes more difficult to support equally and evenly given the decentralization.

Cumulative Climax

Story

Organizational leadership shifts priority to one unifying incremental innovation (Video-based visits within current infrastructure), systematically throughout the organization. More ambitious efforts find homes in particular regions of origin and evolve within a smaller environment.

Risk

Making operational and (infra)structural improvements to the existing products and services to allow for safe, secure, live video based interactions without interruption of current services.

Final Obstacle

Story

New service is built into near 100% of the company and accounts for 21% of Patient/User and physician appointments.

Risk

Organization has shifted even more so to a digital healthcare company and has to manage patient/user expectations around digital experience (virtual) versus in-person experience.

Acknowledgment

Sincere thank you and appreciation to Walter Fisher for his contribution to the world through his insights on human communication. May he rest well, always.

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10

Managing the Strategy-Implementation Gap by Reducing Project Risk

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A recent approach for project design and management—the project value, risk, and opportunity (PVRO) framework—provides an advantageous way to model the work and progress of strategy implementation. This chapter briefly introduces the PVRO framework and illustrates its application to an uncertain and risky strategy implementation project. The framework provides a new perspective on project progress as the reduction of the portion of the project's value being put at risk by the possibility of adverse outcomes. Implementation progress occurs as the risks of failure decrease.

Introduction

Implementing a strategy typically requires work that can be characterized as temporary and unique. These happen to be the definitive characteristics of projects, which seek to deliver a unique result by a deadline and within a resource budget. Thus, much of strategy implementation may be reasonably conceptualized and operationalized as project work, thereby benefiting from the ontologies, methods, and tools of project management. The implementation of a strategy usually requires many projects—a program or a project portfolio; related methods exist for managing these entities as well. Sometimes strategy implementation is pursued explicitly through “strategic projects”; such terminology could be applied even more broadly. Examples of strategic projects include: developing a new product or platform, developing a brand, installing a new information technology system, reengineering a process, readying a new technology, establishing a new production facility, revamping the supply chain, acquiring another company, and divesting a business unit. The goal of such projects is generally to change ongoing operations to increase their alignment with an enterprise's strategic intent. Here, I define the “strategy-implementation gap” as the failure of strategic projects to achieve their stakeholder value goals.

Unfortunately, the conventional methods for project management (summarized, e.g., by the PMBOK Guide [1]), while beneficial, have not proven sufficient to staunch the flow of failed and challenged projects. Many reasons contribute to explaining this situation, some pertaining to the methods themselves and others to the context and manner of their implementation (or lack thereof). Research continues for better understanding of and improved methods for project management. Hence, merely reframing the strategy implementation challenge as a project management one does not solve the problems. Doing so does, however, open the door to applying many useful constructs and techniques that could be quite helpful.

One such approach—the *project value, risk, and opportunity (PVRO) framework*—provides an advantageous way to visualize, model, plan, and control strategy implementation work. Previous articles [2-4] on managing product development projects introduced the PVRO framework (based on an earlier approach called the *risk value method*). Readers are strongly encouraged to consult these prior papers for fuller background and details, as this chapter merely provides a brief overview of the PVRO framework and discusses its applicability to the strategy implementation challenge.

Situational Assumptions

A project may be designed [5] by making choices about the path (through a rugged and uncertain “landscape”) to its desired destination (result). Tactically, project design includes defining, assigning, scheduling, and budgeting project activities and commitments.

For the purposes of this chapter, I take strategy as a given input and assume it is appropriate. Let us furthermore assume that an element of strategy implementation has been “projectized”—i.e., conceived in terms of a temporary organization with assigned resources and tasked to deliver a specified result by a deadline. This assumption is admittedly problematic, because often the specific resources, results, and deadlines are unclear—in which case the initial step in project design should be to obtain greater specificity of these aspects.

PVRO Background

It is helpful to distinguish four types of value in project work. A project’s *actual value* is its final value at completion, based on how things turn out and where it ends up. (Actual value may continue to evolve, post project completion.) A project’s *desired value* is the value its stakeholders seek from it. (This value may be difficult to characterize, as stakeholders may not be able to articulate their values, and they may not agree within themselves or with other stakeholders.) A project achieves its *goal value* (GV) if it meets its chosen goals/targets/objectives/requirements (which may or may not match its desired value). Prior to its completion, a project has a forecasted *likely value* (LV), given its resources and capabilities. The PVRO framework focuses especially on a project’s GV and evolving LV, with the key idea that a project’s actual value depends on the overall costs and benefits of its *result* (not merely on the work it does, as in “earned value management”).

Each of these four types of value may be considered in terms of component elements called *project value attributes* (PVAs). PVAs are characteristics of the project’s result that matter to stakeholders. For example, a product development project’s PVAs would center on the characteristics of the designed product, such as its size, speed, price, etc. In strategy implementation, PVAs would be the major indicators of success, completion, instantiation, etc. PVAs are therefore related to (and in some cases synonymous with) key performance indicators

(KPIs), measures of effectiveness (MoEs), and technical performance measures (TPMs). Because a project should focus on its 5-10 most salient PVAs, PVAs tend to be high-level, composite measures, each driven by numerous sub-elements.

At the end of a project, each of its PVAs has an actual outcome; before then, each may only be estimated. At its beginning, a project faces maximum uncertainty about each PVA's outcome. We can model each PVA as a distribution of possible outcomes, called a *project capability distribution* (PCD). As the project progresses, updated estimates of its PVAs' outcomes revise the PCDs. Over project time, the range of possible outcomes decreases (the PCDs tend to narrow) due to new information and learning.

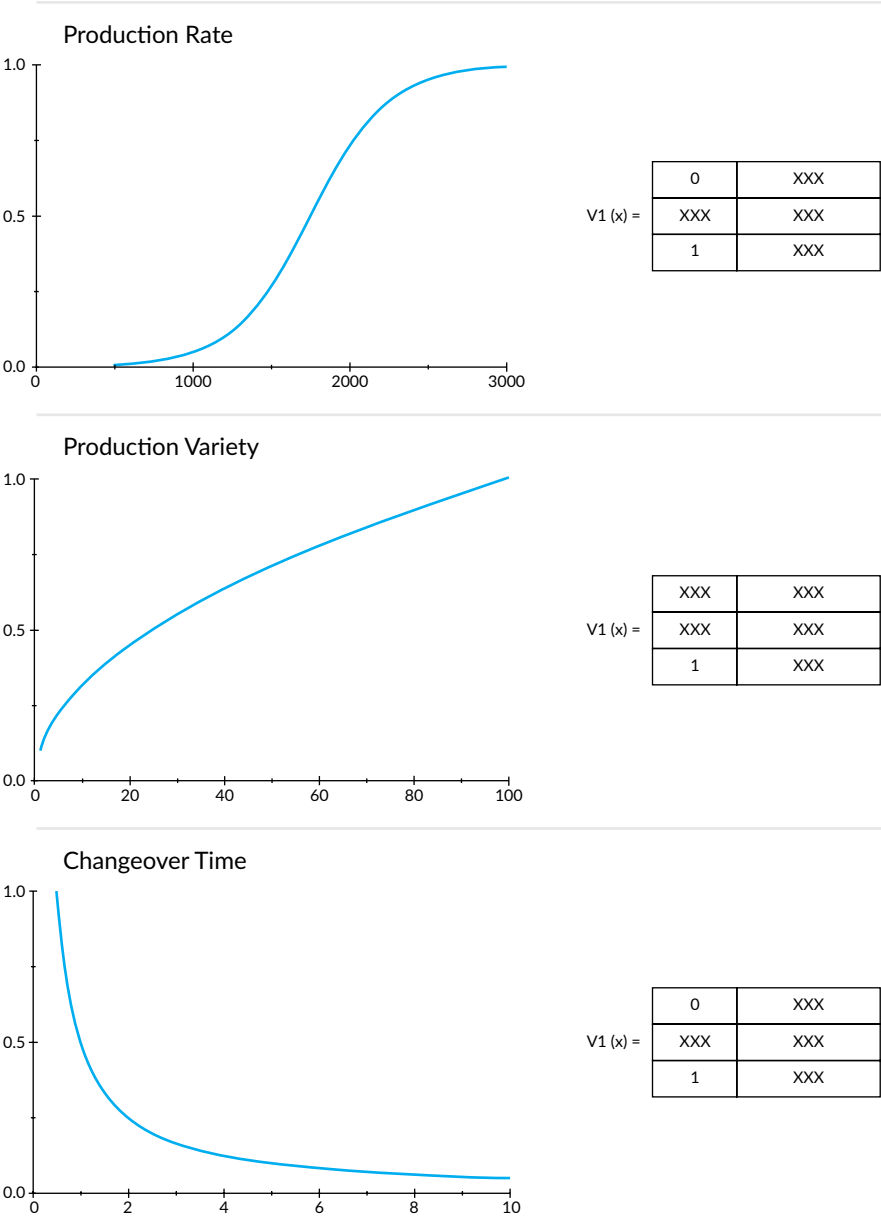
Let us assume each PVA has a set goal, a threshold that separates desirable and undesirable outcomes. A project that achieves all of its PVA goals provides its GV. Any undesirable PVA outcome (i.e., that fails to meet its goal) will reduce project value to some level below its GV. At the beginning of a project, when the range of possible outcomes (both desirable and undesirable) is greatest, the presence of these many undesirable outcomes as eventualities threatens the project's value: they put a portion of the project's value at risk. Using a negative impact (penalty) function, which shows the loss of project value associated with each potential, adverse outcome, we can calculate the expected *value at risk* (VaR) for each PVA and for the project as a whole. We can also calculate the *value at opportunity* (VaO) for each PVA from the portion of its PCD representing desirable outcomes (i.e., ones that meet or exceed the goal) by using a positive impact (reward) function. We may conceive of the VaR as the portion of the project's value threatened by the prevailing uncertainty in the project's outcomes. For further exposition of how all of this occurs, see [3] especially.

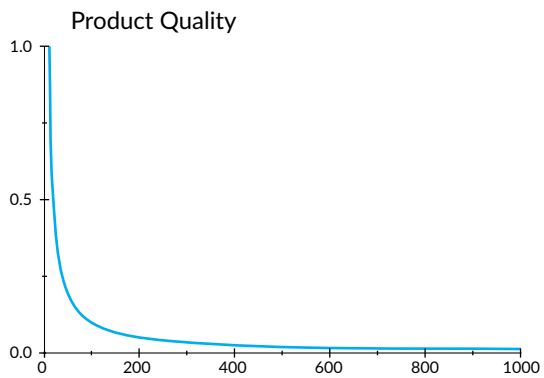
Quantifying and visualizing a project's VaR makes it possible to motivate behaviors associated with targeted learning that serve to accelerate VaR reduction. Activities “add value” to a project by eliminating the possibility of particular adverse outcomes for its PVAs (e.g., by proving that a PVA like “fuel economy” will be greater than some minimum amount). This drives out uncertainty earlier in a project; it provides a “big rocks first” approach to risk management; it supports a “fail fast” approach—all in stark contrast to conventional approaches, which often incentivize starting low-value work prematurely and procrastinating with truly consequential tasks.

Designing a Strategy Implementation Project

Let us consider a hypothetical, strategic project to reengineer a production process for greater agility in terms of higher production variety and lower changeover time. Table 1 lists six PVAs for the project and specifies its associated value function, $V(x)$. The value functions span a range from “delighting” to “disgusting” the stakeholders with the PVA outcomes, and each is specified in simple units of utility in $[0,1]$. (Other units of value, such as expected revenue or profit, could be used instead.) For the first two PVAs, “larger is better” (LIB), meaning that utility increases with PVA outcome, while for the last four “smaller is better” (SIB).

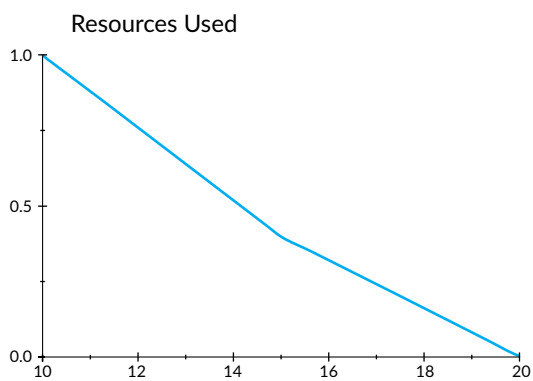
Table 1: Six project Value Attributes (PVAs) and their respective value functions (x-axes are PVA outcomes; y-axes are utility)





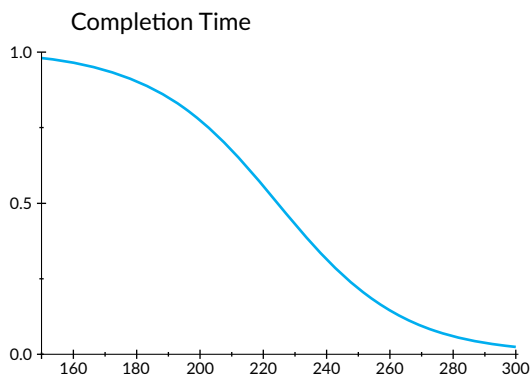
$V1(x) =$

0	XXX
XXX	XXX
1	XXX



$V1(x) =$

XXX	XXX
XXX	XXX
1	XXX



$V1(x) =$

0	XXX
XXX	XXX
1	XXX

Table 2 lists the six PVAs, along with units of measure, type, and weighting of relative importance to the project's overall value. Next, the table provides an initial estimate of each PVA's PCD in terms of a triangle distribution (although any type of probability distribution could be used), where *a* and *b* represent the extreme estimates of *optimistic* and *pessimistic* outcomes (depending on SIB or LIB) and *m* represents the estimated *most likely* outcome. Figure 1 provides an example PCD for the first PVA. Comparing this distribution of potential outcomes to its corresponding value function (upper-left of Table 1), we observe that the most likely outcome (2000 units/wk) provides fairly high utility (0.73), while the best possible outcome (2500) provides excellent utility (0.95) and the worst possible outcome (1000) provides very poor utility (0.05). The PCD implies that the PVA has a wide range of possible outcomes that will result in a wide range of eventual utilities (0.05 to 0.95), although outcomes closer to 2000 are relatively more likely than ones close to either extreme. For any PVA outcome in the range [1000,2500], we may use the PCD and the value function to determine its probability and utility, respectively.

PVA	Units	Type	Weight	a	m	b	G	GV	LV	R	O
Production Rate	units/wk	LIB	0.17	1000	2000	2500	2200	0.86	0.57	0.29	0.00
Production Variety	versions	LIB	0.19	10	50	70	25	0.50	0.65	0.01	0.16
Changeover Time	min.	SIB	0.19	0.5	1.25	4	1	0.50	0.31	0.20	0.01
Product Quality	DPMO	SIB	0.17	15	40	150	15	0.67	0.18	0.49	0.00
Resources Used	\$M	SIB	0.13	10	14	20	12	0.76	0.47	0.30	0.01
Completion Time	workdays	SIB	0.15	150	175	275	170	0.94	0.72	0.22	0.00
Project	Utility	LIB	1.0	n/a	n/a	n/a	n/a	0.69	0.48	0.24	0.03

Table 2: PVRO model for baseline production reengineering project

For each PVA, Table 2 also lists its selected goal (e.g., 2200 units/wk for Production Rate), the value attained by achieving that goal ($GV = V(G) = 0.86$ units of utility), and the expected value of the PCD (the PVA's likely value, LV). We also consider the GV and LV of the overall project as a composite function of the PVAs. Various models may be used for this, each with advantages and disadvantages. Here we show results for the overall project in terms of two models, the weighted average (results given in the bottom row of Table 2, using the weights shown in the table) and the most constraining attribute (result given by the bold-faced, minimum PVA numbers in Table 2). Which of these two models makes the most sense depends on the situation. Generally, as the difference between their respective results increases, the more the most constraining attribute model may apply (because a horrible outcome with one of the PVAs would be more likely to overshadow decent outcomes with all of the others).

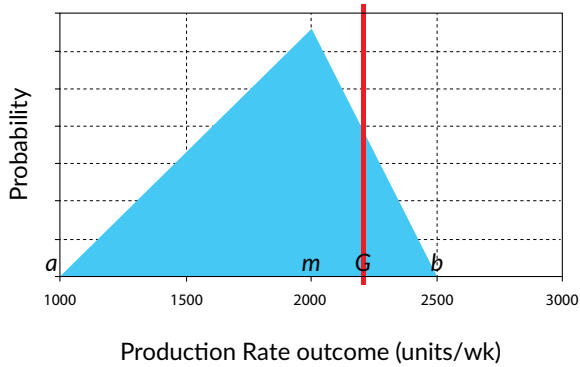


Figure 1: Project capability distribution (PCD) for the Production Rate PVA

If we draw a vertical line at the goal ($G_1 = 2200$) in Figure 1, we split the PCD into regions of desirable ($x_1 \geq G_1$ for a LIB PVA) and undesirable ($x_1 < G_1$ for a LIB PVA) outcomes. When we weight the probability of each undesirable outcome by its value loss ($V_1(G_1) - V_1(x_1)$), we calculate the expected value loss implied by the uncertainty in that PVA's potential outcomes—i.e., the portion of the PVA's value being put at risk, R_1 . Similarly, we calculate the PVA's expected value at opportunity, O_1 , by weighting the probability of each desirable outcome by its value bonus ($V_1(x_1) - V_1(G_1)$). Again, across all PVAs, we can model the overall project's *value at risk* (VaR) or R as the weighted average of R for all PVAs or in terms of the single riskiest PVA. In Table 2 we interpret the overall project R as putting 0.24 of the 0.69 units of project GV at risk, while 0.03 units of additional project *value are at opportunity* (VaO). Note that R and O are functions of both the project's capabilities (represented by the PCDs, the likelihoods of achieving various outcomes) and its specified goals. All else being equal, shifting the PCD for a LIB PVA to the right will decrease R and increase O , as will shifting G to the left (making the goal less challenging).

Examining the situation in Table 2, we observe that the goal of 2200 units/week for Production Rate seems very challenging (in fact, 88% of PCD outcomes fail to achieve it); it puts 0.29 units of the project's GV at risk. Meanwhile, the goal for Production Variety is quite tame (over 90% of PCD outcomes achieve it); it puts very little of the project's value at risk, but it leaves 0.16 units of value “on the table” by choosing such an easy goal, and it lowers the project's overall GV. If possible, project planners should consider trading off some Production Variety for an increase in Production Rate. Changeover Time is a more problematic PVA, because its chosen goal, while providing little GV, is still quite risky to achieve. The project might need additional resources, technologies, and/or other capabilities to shift this PCD in a more favorable direction. The Product Quality PVA contributes the greatest risk to the project's value. The goals for Resources Used and project Completion Time are also fairly optimistic, given the PCDs for these PVAs. Project planners may also explore alternative settings for project goals and capabilities. For example, it is likely that the allocation of additional resources could shift some PCDs in favorable directions, while some goals may be relaxed or increased so as to design a project for a desirable level of risk.

While not shown in this example due to space constraints, the next step in applying the PVRO framework is to identify which of the project’s activities will generate new information to revise one or more PCD estimates. Completing any of these activities will update some of the values in Table 2. Project planners may simulate project progress with anticipated activity finish times and revision magnitudes, and, as shown below, project monitors and controllers may replace these estimates with actuals as the project unfolds.

Monitoring and Controlling a Strategy Implementation Project

As a project progresses, its activities generate new information that may be used to revise the PCD estimates and thus R and O. Continuing with the example project, Figure 2 shows an example PVA tracking chart over project time. Time zero corresponds to the situation in Table 2, at the beginning of the project, where the PCD is a triangle distribution defined by the three points (a, m, b) indicated by the vertical bar overlaying the left y-axis. Here, the goal ($G_1 = 2200$) is indicated by the solid, horizontal line. The initial R for the Production Rate PVA, 0.29, is indicated by the left-most point along the larger dashed line (and measured by the right y-axis). At day 18, new information revises the worst-case outcome from 1000 to 1100 units/week, which causes R to drop slightly—mainly because, now, some really bad outcomes (<1100 units/week) are no longer possible. Further revisions change the PCD parameters in random ways, but, overall, the PCD tends to narrow as information replaces uncertainty about project outcomes. By day 168 the expected outcome has settled well below the goal, leaving 0.13 units of the GV at risk.

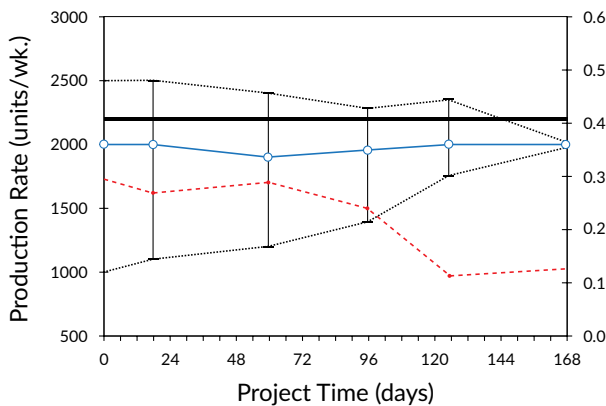


Figure 2: Tracking PCD evolution and R over project time for the Production Rate PVA

By its completion, a fully successful project should drive its VaR to zero. Projects that do not accomplish this have failed to meet one or more of their goals. Figure 3 tracks the example project’s overall VaR in terms of the weighted contributions of its PVAs. As of day 168, the Production Rate PVA contributes $wR = (0.17)(0.13) = 0.02$ of the project’s overall VaR of 0.16, where w is the PVA’s weight. Product Quality and Resources Used, each with a weighted contribution of 0.05 at that

point, make up the largest components of the project's VaR. Thus, this example project has not fared well in terms of its ultimate results. Although the project made some significant progress around days 126 and 168, it was too little too late: the overall risk profile remained stubbornly high over the course of the project. A more desirable VaR reduction profile for each PVA and the overall project would look more like the Changeover Time value function in Table 1, with a front-loading of the work that would quickly drive out the biggest risks—or, failing that, enable an earlier project termination decision (a “fail fast” strategy).

For a related application of part of the PVRO framework to a real project, along with a simulation of the emergent path across the project's “rugged landscape,” see [6].

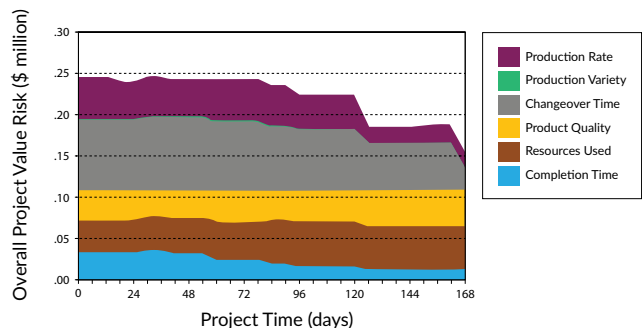


Figure 3: Tracking the project's overall value at risk (R) in terms of the weighted contributions of its PVAs

Conclusion

How does the PVRO framework help close the strategy-implementation gap? By helping to plan and manage the work of implementation as a project—one that achieves its aims by reducing the likelihood of adverse outcomes in terms of the key attributes that stakeholders value—the PVRO framework helps focus attention on the most important areas as the project evolves. It helps participants think and act in terms of uncertainty and risk, rather than mere point estimates. It provides a new way to think about progress and adding value. Rather than viewing “value added” as work done, the PVRO framework makes a subtle shift by equating progress with the removal of “anti-value” (threats to project value) by doing work that creates useful information that reduces the risk of *not* getting the desired result. Like a sculptor of marble, the desired result emerges by chipping away the undesired material—here, potential, adverse outcomes. Rather than having all project indicators showing “green” until things go wrong (when they suddenly turn “red”), the PVRO framework looks at the indicators as “red” until proven “yellow” and then “green.” This way of viewing projects holds potential for designing and managing the progress of the project-type work of implementing strategy. Going forward, it would be very interesting to compare applications to a variety of strategic projects.

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11

Development of Collaborative Modeling Environment to Reduce Unbalanced Contribution in Group Decision Making

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The objective of this study is to construct a collaborative modeling environment, which makes members' contribution balanced in the system modeling process. To achieve this objective, we developed an instrument for collaborative model building. The instrument is a combination of sensors and a cloud application on the Web, and it provides not only modeling tools for cocreation, such as a drawing diagram tool, but also the team's behavior monitoring tools, which measure each member's contribution in real time, detecting the unbalanced contribution and returning the feedback to the members automatically.

In a case study, we applied the instrumented workshop for a student team in the University of Tokyo to build a stakeholder value network. Through the case study, we tested the function to detect unbalanced contribution in the group and demonstrated the feasibility of the proposed environment.

Introduction

Strategy is usually made by a group or multiple stakeholders and is a result of their decision-making. Basically, the group or stakeholders try to implement their product or service based on the strategy. However, the outcome is not always successful, even if the strategy is good. Brightline Initiative [1] reported that a bunch of companies have experienced a struggle to fill the gap between strategy and implementation. These gaps between the strategy and implementation are caused by either poor, unrealistic strategy; poor, incompetent implementation; or some communication problem between the two, such that either implementers or strategists cannot fully understand the other's intent and situation. To overcome the second reason, project management is traditionally studied and utilized. This study focuses on the first and third reasons.

A well-implemented model-based approach to make a strategy, especially cocreation of a model by a group, provides various kinds of contributions, for example, mental model refinement, mental model alignment, consensus, commitment to decisions and so on [2][3]. A part of a system model's role is characterizing a system [4]. Moreover, cocreation process involves various kinds of stakeholders, not only strategy makers but also implementors. By realizing and promoting communication between strategy and implementation, those contributions from the model-based approach can fill the gap between the two.

However, some previous work reports that such group decision-making can cause various kinds of biases that are emergent phenomena in the group, for example, groupthink, group escalation, group polarization, and false consensus. We especially focus on the modeling process, which is also conducted by a group or multiple stakeholders. Because the procedure is also a group activity, it is needed to be careful that the group can build a system model without any group biases.

One of the solutions to reduce risk of the group biases is balanced communication and a group that is not dominated by a few members. Woolley et al. [6] show that groups that a few people dominate have less collective intelligence. Some psychological study [5][7] shows that those risks frequently happen when there are people who dominate or pressure the groups, preventing free communication.

On the basis of their study, this study set the objective as the construction of a collaborative modeling environment, which makes members' contribution balanced in the system modeling process. To achieve this objective, we developed an instrument for collaborative model building. The instrument is a combination of sensors and a cloud application on the Web, and it provides not only modeling tools for cocreation, such as a drawing diagram tool, but also the team's behavior monitoring tools, which measure each member's contribution in real time, detecting the unbalanced contribution and returning the feedback to the members automatically.

In a case study, we applied the instrumented workshop for a student team in the University of Tokyo to build a stakeholder value network. Through the case study, we tested the function to detect unbalanced contribution in the group and demonstrated the feasibility of the proposed environment.

Proposed Method and Modeling Environment

A. Method to detect unbalanced contribution

In this section, how to detect unbalanced contribution in the group modeling process. To detect the unbalanced contribution, we propose contribution mapping on a model, which is a visualization of each member's contribution degree on a model diagram. Fig. 1 shows the example of the contribution mapping.

The percentage of the member's contribution is calculated, and the percentage is mapped on the model diagram by color gradation. This method to visualize unbalanced contribution assumes that diagram drawing is included as a process in modeling.

The calculation of the percentage of contribution is based on two kinds of data; one is a conversation log and the other is a modeling log. A conversation log is log data of conversations in modeling among members, and the data can be obtained as audio data, text data and so on. The data should include a timestamp and the conversation content. A modeling log is log data of the members' actions in model drawing, for example, adding a text box, adding an arrow, writing text, etc. The modeling log should also include a timestamp with each kind of modeling action. By connecting these two kinds of data, how much conversation is conducted for an action by a member of group can be calculated. It is represented as $A_{action,member}^{action}$. On the basis of the data, the percentage of contribution by each member can be calculated by Equation (1).

$$C_{member, model} = \frac{\sum_{action} A_{action,member}^{action}}{\sum_{action} \sum_{member} A_{action,member}^{action}} \quad (1)$$

Equation (1) assumes that parts of the model can be represented by the sum of actions. After the calculation, opacity of part of the model diagram is set as the $C_{member, model}$, and a contribution map is obtained for each member.

Final deliverable: **Model diagram**

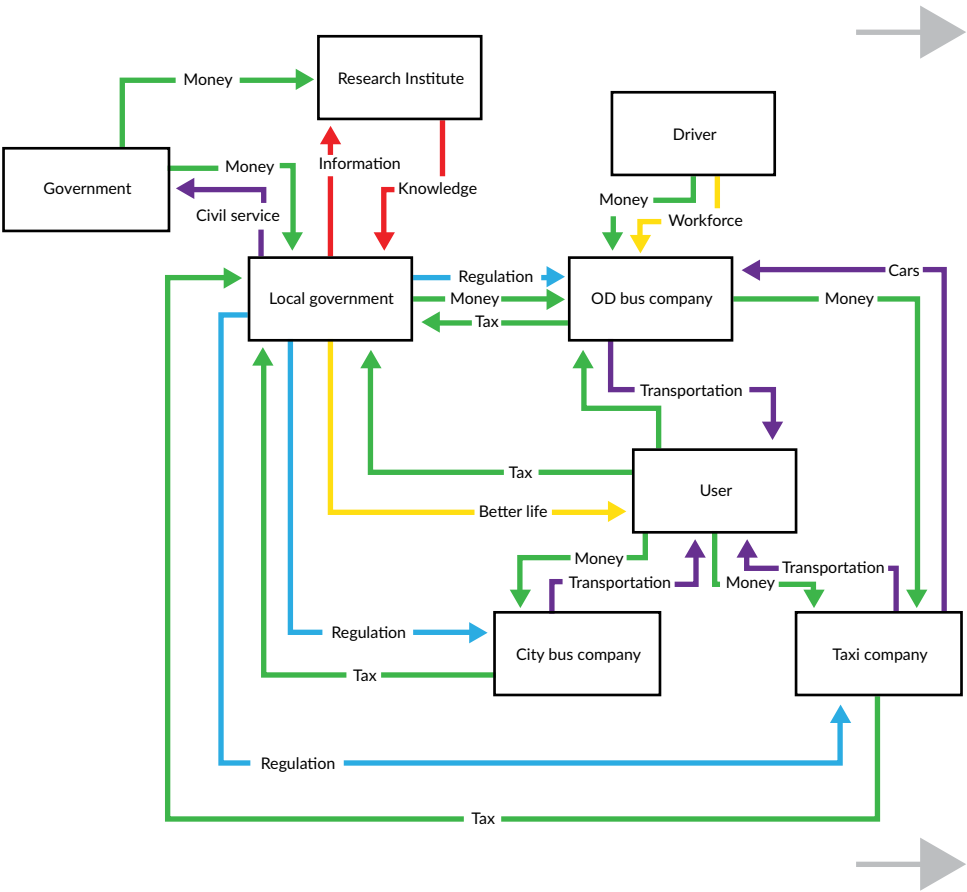
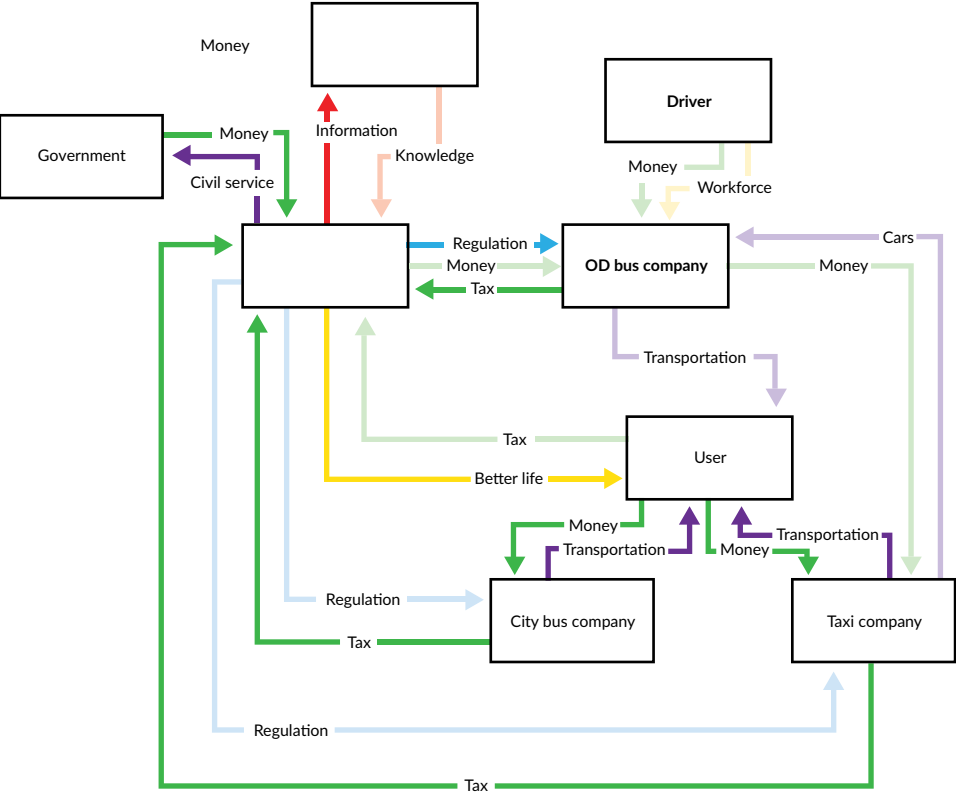


Figure 1: Example of contribution mapping. Darker lines indicate larger attention and contribution by a participant.

Post analysis: **Contribution Mapping**



B. Instrumented environment by software and sensors

To realize the contribution mapping and provide feedback in real time, an instrumented environment is needed to collect the conversation and modeling logs and process those data into contribution mapping. For the environment, we developed software and hardware to monitor the group behavior and process behind their working. Fig.2 shows the overview of the system we developed. At user side, hardware monitors their conversation log by audio data, and software captures their modeling log. Those data are sent to a remote server via a wireless network and processed at server side.

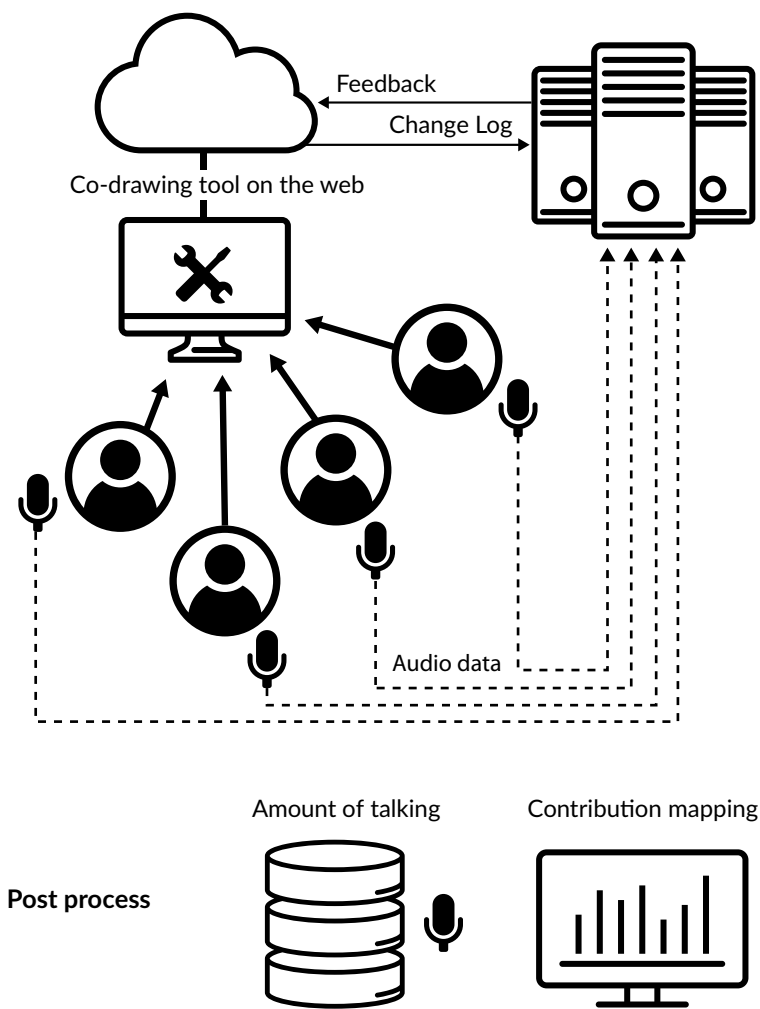


Figure 2: Overview of the developed instrumented environment for group modeling.

Fig. 3 shows the implementation of the hardware to collect audio data naturally in modeling. The table assumes four members in a group, and for each member USB cameras and microphones are installed. Microcomputers collect data from the sensors and send the data to the server by a wireless network. By comparing these microphones' data, speaker identification is conducted, and a conversation log can be obtained. The method to identify who is speaking is based on volume of audio data. Audio data from four microphones are synchronized by the timestamp.

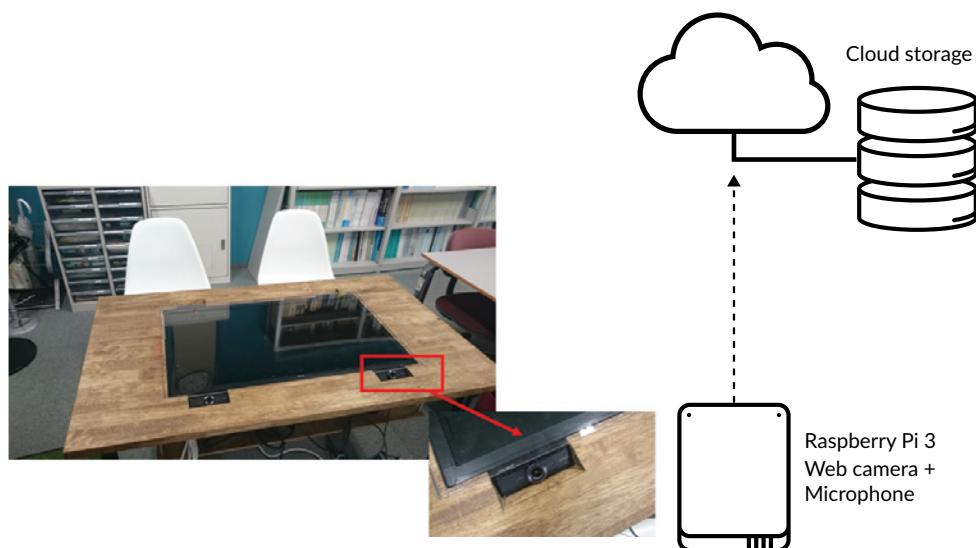


Figure 3: Workshop table, which is a part of the developed instrumented environment for group modeling. The table can naturally collect audio and video data from each member

The volume of each audio data is calculated, and the microphone that monitors the biggest audio is identified. The person who is in front of the identified microphone is identified as the speaker. By sharing a screen centered on the table, the members can cocreate their model. Over the screen, a plastic plate is set, and the plate allows users to write their thinking with whiteboard markers. Of course, users can also operate the screen's content by their laptop; however, the function is to realize easier idea sharing and promote more conversation.

Fig. 4 shows a user interface of the developed software. The software provides the drawing function for a specific model diagram. In the group modeling, the group draws their system model by this UI, and behind their working, the software is monitoring their change log and sending it to the server automatically. The data of the diagram is converted to JSON format and through http connection the data is accumulated in the server. For the server-side implementation, Java and Spring frameworks are utilized. The server-side application provides

RESTful API to access the data and allows people to conduct post-analysis after the modeling. For the implementation of the drawing diagram, Joint.js is used and the UI works as a web application. For now, the UI provides a drawing function only for the stakeholder value network (SVN) [8]. However, the drawing library has high flexibility to draw diagrams, and we are able to apply the same functionality to the other diagrams, such as OPM[9], SysML[10] and so on.

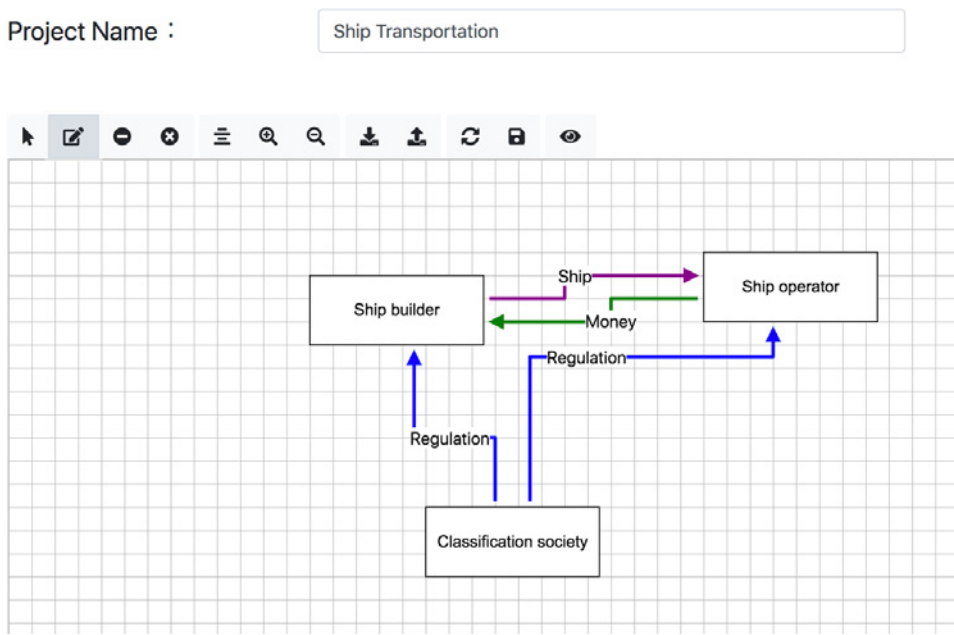


Figure 4: UI of the developed software to make SVN model.

Case study

We conducted a brief experiment in a lab environment to test the developed system's functionality and the feasibility of our idea to grasp unbalanced contribution in the modeling process. In this section, the overview of the experiment and the results are explained in detail.

A. Overview and procedure of experiment

A workshop to write SVN was held in our laboratory. SVN is a model to analyze stakeholders of a project at an early stage of system architecture or strategy making. In SVN, stakeholders and their values' inflow and outflow are mapped in the diagram. In the diagram, rectangles represent stakeholders and arrows are value flow between them. In drawing value flow, the green arrow shows monetary value, the blue arrow shows regulation and policy, the purple arrow shows goods and service and the red arrow shows the other kinds of value flow, e.g. information, technology, public benefit and so on. The participants were four students from the

University of Tokyo, and the topic was an on-demand bus system in Japan. The workshop took around 35 minutes. The developed table was applied to the workshop. However, they didn't use drawing software to write the diagram. They used pencils and wrote their diagram on the plastic plate over the table's screen. The table's microphone array collected audio data from each participant and one video camera recorded their modeling log.

The objectives of this experiment were to verify an accuracy of the function to detect who is talking and how much he or she talked with a time-based approach using data from microphones. And it also tried to test the idea of contribution mapping and demonstrate the feasibility. To achieve these objectives, two kinds of analysis were conducted based on the workshop data; one was comparison of speaker identification results, which compares the results of human and machine, and the other was the building of contribution mapping.

B. Comparison of speaker identification

From the audio data obtained by the developed table, the system automatically identified the speakers. In this section, the result of the speaker identification is shown and compared to the result of human labeling. For the result of human labeling, we played back all the audio data and put labels which show who was speaking. The sampling time by human labeling is 1[s], and we made around 2100 labels for the audio data.

The result of the comparison is shown in Fig. 5. A bunch of comparison sets were obtained, and only the result from 12 minutes to 13 minutes is shown in Fig. 5.

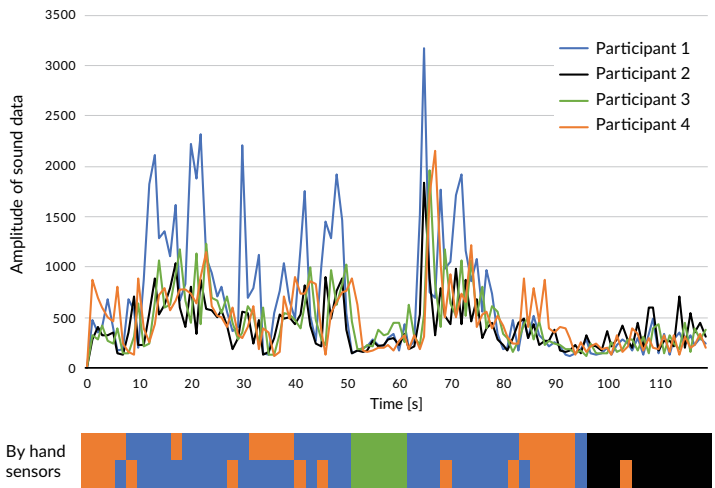


Figure 5: Comparison between the result by human and the result by the developed system. This figure shows the result of the data from 12:00 ~ 13:00. The upper graph shows the raw data's amplitude of audio data and the lower diagram shows the comparison. Each color represents who is talking and corresponds to the colors in the upper graph.

The upper graph shows the raw data of the audio data's amplitude and the lower diagram shows the comparison. Each color represents who is talking and corresponds to the colors in the upper graph. By taking a look at both, it is verified that the processing of audio data is conducted appropriately. Moreover, by focusing on the lower diagram, it is verified that the logic of speaker identification works well. In the result by the system, some orange pulses can be observed. This is because the person represented by orange was the facilitator of this workshop and he had a role to draw the diagram. The noise made by him appears as the pulses in the result.

C. Result of contribution mapping on model diagram

Fig. 6 shows that the result of contribution mapping that is built by audio and video data. From audio data, a conversation log was extracted, and from video data, we extracted 41 actions and the timestamp as the modeling log. In Fig. 6, the results of two participants are picked as representative. The mapping diagram clearly shows the difference between the two participants' contribution and their focus on the model. Participant 1 is one of the most senior students in the group and it is shown that he contributed in the most part to the model. On the other hand, participant 3 is the most junior student and doesn't have knowledge about the on-demand bus system. The diagram on the right clearly shows his low contribution to the model, and his focus was put on the relationship, which is at the upper left of the model. The relationship is between government, local government and a research institute, and is relatively general compared to the other part of the model. This is the reason why his contribution concentrated on only this part.

“ A goal is a declaration of intent, an assertion of where and what we want to be after exerting energy and effort. ”

Discussion

By running through the proposed method to detect unbalanced contribution in the group modeling process, two actions by participants are found, which are not considered in assumptions for calculating contribution percentage and can prevent to express the contribution precisely on model diagram. One is moving to the next topic in the time others are still writing the diagram that is related to the previous topic; the other is writing the diagram before consensus.

The first behavior is observed because writing the diagram takes time for one participant who has a role to write down the diagram, and in the duration, the other participants are free and don't have anything to do. Then, the participants not writing the diagram start conversations about different topics. When we allow the participants to behave like this, it is easily assumed that there is conversation that is made in drawing the diagram but not related to the action itself. To prevent this behavior, well-implemented UI is one of the solutions. It can reduce the time taken to draw the diagram and make the participants concentrate on the model more and more. Also, a function to hide the other parts of the model in drawing can be helpful. By our observation, their conversation, which was made in model drawing and not related to the drawing, was about the other parts of the model. By hiding the other parts of model, the UI forces the participants to concentrate on the part of the model they are now drawing.

The second behavior is caused by the person who operates the software to draw a diagram and happens at the time he wants to convince the others. It is easier for them to write something to show his idea than to explain it to convince the others. However, the action doesn't include the others' ideas and reflects only the drawer's idea. To use a modeling log to visualize a contribution map on a model diagram, it is better that the modeling log includes only the actions that are based on every participant's consensus. To prevent this behavior, we need to announce that the participants should write their diagram on the basis of the consensus. We can tell participants they can use whiteboard markers to show their ideas, and ask them not to write content that is not based on their consensus, by the software.

Conclusion

The objective of this study is the construction of a collaborative modeling environment that makes members' contribution balanced in the system modeling process. To achieve this objective, we developed an instrument for collaborative model building. The instrument is a combination of sensors and a cloud application on the Web, and it provides not only modeling tools for cocreation, such as a drawing diagram tool, but also the team's behavior monitoring tools, which measure each member's contribution in real time, detecting the unbalanced contribution and returning the feedback to the members automatically.

Participant 1

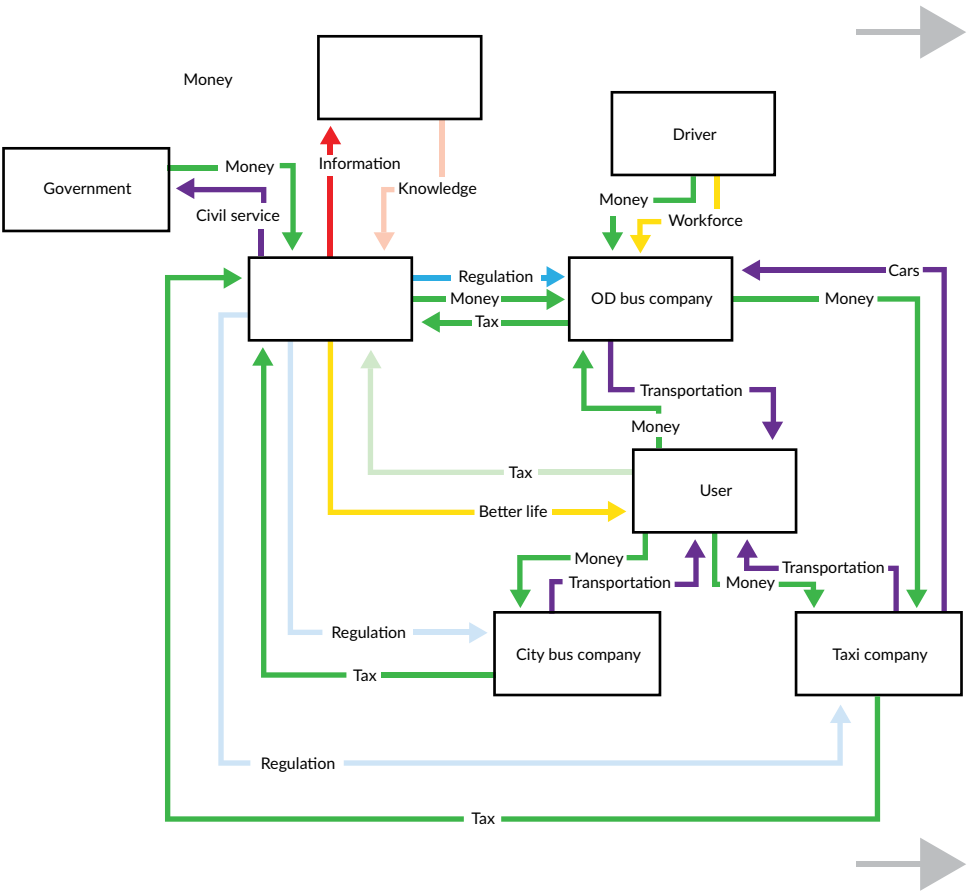
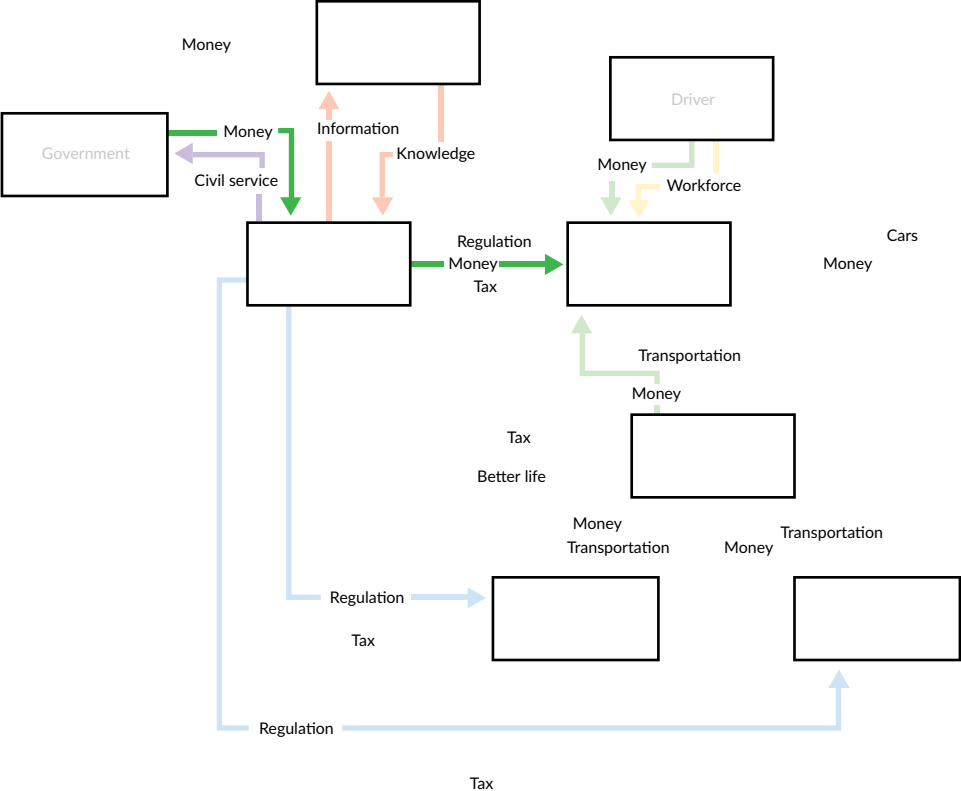


Figure 6: The result of contribution mapping on the model. This shows the results of two participants. The stakeholders shown in boxes and flows shown as arrows are highlighted based on the degree of engagement on these topics by each participant.

Participant 3



In a case study, we applied the instrumented workshop for a student team in the University of Tokyo to build a stakeholder value network. Through the case study, we tested the function to detect unbalanced contribution in the group and demonstrated the feasibility of the proposed environment. Especially, by comparing the results of speaker identification that is made by a human with that made by the developed system, the processing of audio data and the functionality of speaker identification by the developed system is verified. And, attempting to build a contribution map on a model diagram shows the usefulness of the mapping, and reveals some future work to make it more precise to represent actual situations.

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12

Linking Strategic, Tactical and Operational Project Decisions: A Model-Based Approach for Design, Planning and Execution

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This research suggests a model-based approach for linking strategic project decisions, such as the selection of design modes and technologies, to tactical and operational decisions, as well as setting specific schedules and allocating resources to project activities. We develop a model that combines quantitative project management models that focus on time and cost with value-focused qualitative methodologies by extending the multi-mode resource-constrained project scheduling problem (MRCPSP) to include value aspects (e.g., technical performance). A genetic algorithm solves the problem to near optimality in reasonable computational times. An efficiency frontier of project plans, where each plan on the frontier achieves the best value for its cost, enables decision-makers to select their preferred plan. Then, we use a robust optimization approach for making tactical project decisions in uncertain environments. Stochasticity is manifested by uncertain activity durations, which leads to stochastic resource demands and costs. The objective is to minimize the project duration while taking uncertainty into account. We formulate the robust MRCPSP, develop an analytical solution approach, and examine its performance compared to other alternatives. We discuss how the level of conservatism and other conditions affect the price of robustness.

In recent years, there has been a shift to value-focused project management approaches such as Lean Project Management [1] and stakeholder management [2], which aspire to maximize a project's value [3]. Most value-focused approaches involve teamwork, brainstorming, integrated product teams. Nevertheless, there is a need for a model that jointly considers time, cost and value [4, 5, 6, 7] and quantitative models can substantially enhance all these methodologies [1, 8, 9].

Accordingly, we suggest a quantitative model that combines project and product scopes; the former involves time, cost and resource considerations and the latter mainly deals with the product's technical performance. Both scopes affect a project's success [10]. For example, designing a new product can lead to high technical performance but may be costlier and take longer compared to upgrading an existing system.

Combining project and product scopes relates to the literature about balancing time, cost and value [11, 12, 13, 14] and to the literature about quantifying risk and lost opportunity [14]. We extend the multi-mode resource-constrained project scheduling problem (MRCPSP), an NP-hard problem [15], by setting its objective to maximize a project's value subject to budget and resource constraints.

The MRCPSP can be viewed as a decision problem in which the decision maker chooses between competing alternatives. During a project's front-end, technological configuration decisions are made and have a significant impact on a project's duration, cost and performance. Our model accomodates these impacts through activities' mode selections; each may impact cost, time and performance.

The second suggested model demonstrates the conditions under which a so-called "conservative" decision-making approach is superior compared to deterministic decision-making approaches. Again, we use a stochastic version of the MRCPSP, where activity durations are uncertain. Hence, costs and resource requirements are also uncertain. We draw from the emerging literature about reactive and proactive scheduling; see a review by Herroelen and Leus [16]. We use a robust optimization (RO) approach to decide on mode selections and resource allocations. RO is a relatively recent optimization approach [17, 18] that finds an optimal solution that is feasible for any realization within a given uncertainty set. To the best of our knowledge, there is a limited amount of research about RO in the context of project management, with the exceptions of [19, 20, 21]. Moreover, to the best of our knowledge RO is not used for the MRCPSP; although two recent papers use RO for the resource-constrained project scheduling problem without modes [20, 21], using polyhedral uncertainty sets. In the present paper, we develop a robust optimization model for the MRCPSP. Due to space limitations, we present only the basic mathematical formulations. In Section 2, we present the value maximization model followed by details about the solution approach and examples in Sections 2.1 and 2.2, respectively. Then, in Section 3 we present the RO model, its solution approach (Section 3.1) and experimental results (Section 3.2). Section 4 concludes the paper.

2 The Value Maximization Model

Consider a decision maker who aims to maximize a project's value under resources, precedence and budget constraints. The model accomodates both renewable and non-renewable resources (i.e., cash). The mathematical formulation is omitted for compactness; interested readers can find more details in [22]. The model can be used to describe a large variety of project types and settings. For example, the objective could be changed to duration minimization, as in the classical MRCPSP.

2.1 The Solution Approach

In theory, the mathematical formulation can be solved to optimality using commercial solvers (specifically, we use Matlab in conjunction with CVX and Gurobi), but this is time consuming for large problems. Therefore, we develop a genetic algorithm, which is validated vs. optimal solutions of our mathematical formulation, for small projects. Our choice of a genetic algorithm is based on the popularity and good performance of such algorithms for solving resource-constrained scheduling problems [23, 24, 25], as well as on its easy implementation. Through numerical tests we show that the genetic algorithm is rather accurate (less than 1% deviation

compared to optimal solutions) and achieves reasonable solution times for off-line optimization (CPU time of less than a minute).

We omit additional details about the solution approach in favor of presenting two illustrative examples, which are taken from our prior research [22].

2.2 Illustrative Examples

This section provides two examples for the implementation of the suggested approach. The examples are based on real projects performed in an international organization although they have been stylized. Data is changed to preserve the anonymity of the organization.

2.2.1 First Example: A Radar Development Project

We use a simplified radar development project to illustrate the suggested approach. A radar transmits energy into space. The radar receiver analyzes the energy, when returned due to reflections, to provide information about range, location and direction of discovered objects. The main parts of a radar are its transmitter, receiver and antenna. The objective in this project is to maximize the technical performance subject to a given budget. Technical performance amounts to: 1) the radar range, noted by $v = 1$, where it must be higher than or equal to 12 miles, so $F_1(\cdot) \geq 12$; 2) its quality, formally described as $F_2(\cdot) \geq 75$, and 3) its reliability ($v = 3$) that must be higher than or equal to 65%, so $F_3(\cdot) \geq 65$. The technical performance is the weighted sum of the three characteristics, calculated as:

$$P(F_v(\cdot)) = 7 \cdot F_1(\cdot) + 8 \cdot F_2(\cdot) + 6 \cdot F_3(\cdot),$$

where the weights are 7, 8 and 6 for the range, quality and reliability, respectively (as determined through a Quality Function Deployment procedure [26]).

Fig. 1 presents the project network.

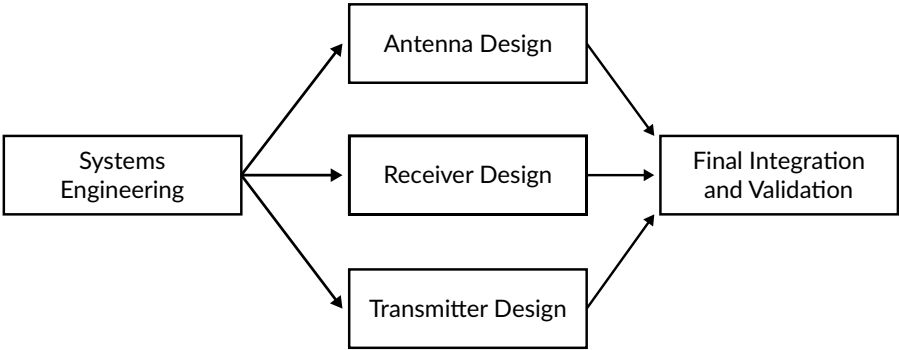


Figure 1: An AON representation of the project, based on [22].

Each of the radar aspects, its range, quality and reliability is defined as a function of the activities' performances (e.g., transmitterpower, receiver sensitivity and antenna gain, inspired by the radar equation [29]). The determination of these different values assumes, among other things, that higher qualities of activities increase the final product's quality and that radar reliability is determinated to be a function of the design reliabilities of the transmitter, receiver, antenna and integration effort.

The due date of the project is fixed to 16 time periods and is associated with a penalty of 20,000 monetary units per period for late completion and a bonus of 10,000 monetary units per period for early completion. The project starts with 28,000 monetary units.

According to this project and its parameters, the mathematical problem (see [22]) is solved. The algorithm provides (near-) optimal project plans, with a mean CPU of 2.46 seconds. Here, the optimal solution yields a maximal value of 100 associated with a cost of 33,260 monetary units.

The project manager can use this model for both planning and control. Indeed, the model provides an initial plan and permits one to conduct sensivity tests. Also, it can be used as a control tool. For example, if an activity has been delayed, the problem can be resolved, according to the previous data, and the plan can be, partially or not, revised.

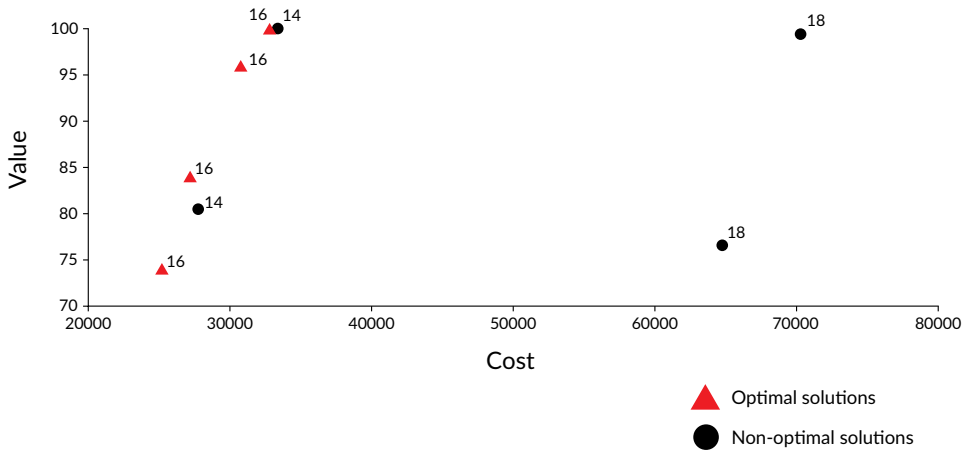


Fig. 2 presents all feasible solutions (out of the $2^5 = 32$ possible mode combinations). The 'Δ's mark the four efficient solutions; that is, project plans that maximize the value subject to a given cost. All other solutions, marked by 'O's, represent inefficient project plans.

Figure 2: Value and cost combinations for the radar development project; 'Δ's and 'O's represent efficient and inferior project plans, respectively, with the corresponding duration next to each solution [22].

2.2.2 Second Example: A Transceiver Development Project

The second example, adopted from [28], is based on a development project of an airborne communication system and includes the development of a transceiver, an amplifier, an antenna, and a power supply.

Cohen and Iluz [28] demonstrate how customer requirements are translated into the model's parameters and values.

Fig. 3 presents the project's AON.

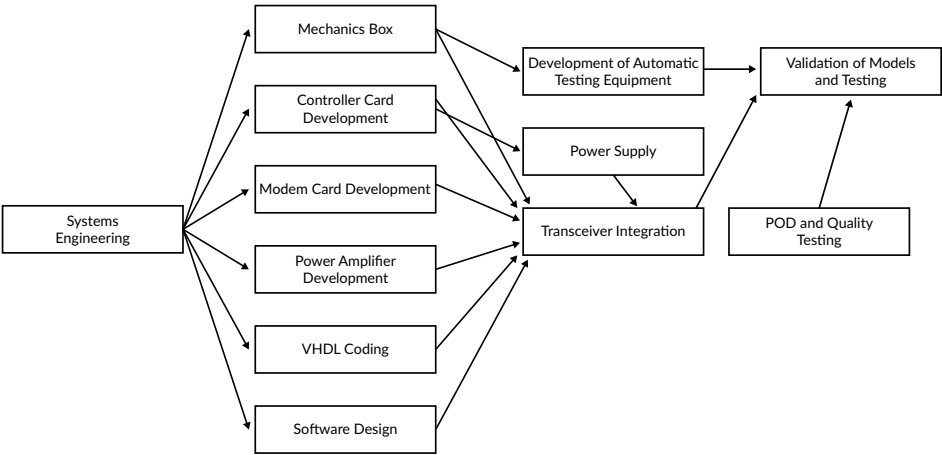


Figure 3: An AON representation of the project, based on [22].

The project due date is fixed to 22 time periods and is associated with a penalty of 1,000 monetary units per period for late completion and a bonus of 500 monetary units per period for early completion. The project starts with 70,000 monetary units.

The project includes three value characteristics: 1) The volume value is a function of the volumes of the project components (i.e., controller, modem and power supply); 2) The noise figure value; and 3) The transmitted power. The global value function is a weighted sum of the three value characteristics.

When the number of activities is 12 and the number of modes is 3, there are 2^{12} possible mode combinations. For each one, there are many possible resource allocations and schedules. Then, a project manager cannot explore all the potential solutions. Solving the suggested problem provides an efficient frontier that enables the project manager to focus on efficient plans.

The mean CPU for solving this specific instance is short enough (6.91 seconds) to enable the project manager to run and analyze multiple solutions online before starting the project.

3 RO Model

This model's objective is to minimize a project duration while taking uncertainty into account in the sense that the project plan remains feasible for all duration realizations within an uncertainty set. As in the first model, the resulting plan sets activity modes, schedules and resource allocations and is subject to precedence and resource constraints.

Fig. 4 presents all efficient solutions for the transceiver development project.

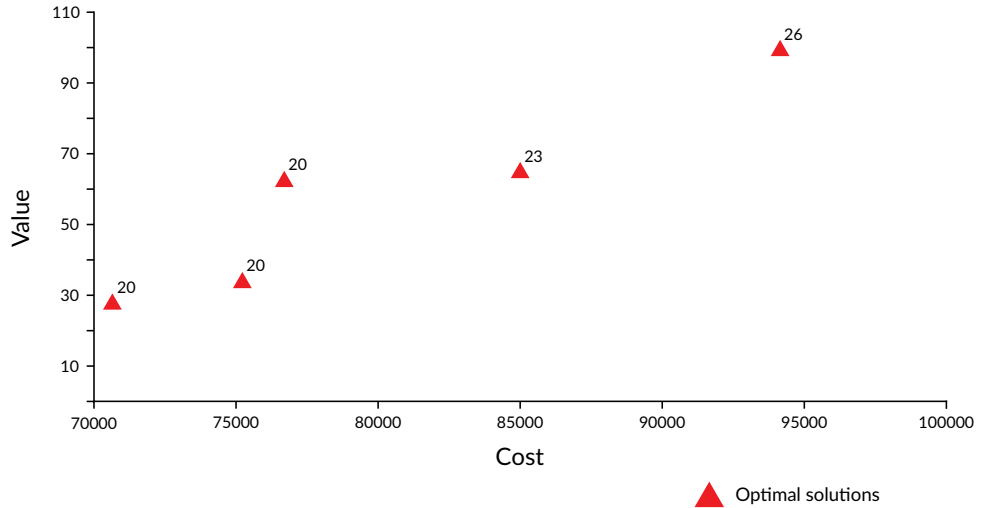


Figure 4: Transceiver development project: Efficient value and cost combinations of different project plans. The duration is indicated next to each solution [22].

Robustness ensures that the plan is feasible for all possible activity realizations within an uncertainty set. To this end, we assume that activity durations vary randomly within a so-called uncertainty set without assuming any knowledge about the distribution. An optimal robust solution is one that solves the robust optimization problem. The tractability of this new optimization problem, called the robust counterpart, strongly depends on the uncertainty set's nature. Ben-Tal et al. [17] show that a robust counterpart of an uncertain linear problem is also linear under a polyhedral uncertainty set. A typical example of a polyhedral set is the case of interval uncertainty, also called a box. For a non-polyhedral set, such as the case of ellipsoidal uncertainty, Ben-Tal et al. [17] show that a robust counterpart of an uncertain linear problem is quadratic. Since we formulate our problem with integer variables, we assume that uncertainty sets are polyhedral in order to maintain linear constraints. In our model, uncertain durations are defined over the polyhedral uncertainty set. We formulate the robust MRCPSP, develop an analytical solution approach, and examine its performance compared to other alternatives. Most of the mathematical details are omitted from this paper.

3.1 The Solution Approach

When the uncertainty set is a box (hypercube), it can be shown that solving the RMRCPSPP is equivalent to solving a deterministic MRCPSP for the worst-case activity duration vector. We model uncertainty through an uncertainty set inspired by Bertsimas and Sim [29]. The particularity of this set is its flexibility to adjust the level of conservatism and robustness through a so-called budget parameter, Γ , representing the number of activities allowed to deviate from their nominal durations. The parameter Γ can vary between 0 and n .

When $\Gamma = 0$, the model is equivalent to its deterministic version whereas when $\Gamma = 0$, where n is the number of activities, all activities may deviate.

The structure of the RMRCPSPP encourages us to use a Benders' solution approach for solving it [30]. Benders' decomposition algorithm is an iterative algorithm; at the initial iteration, the lower bound of the objective equals $-\infty$ and its upper bound equals ∞ . At each iteration, we solve a master problem that provides an updated lower bound and a subproblem that provides an updated upper bound. Once the subproblem is solved, valid cuts are calculated and added to the master problem formulation. The procedure stops when the lower bound converges to the upper bound. Due to space limitations, we omit the formulation and dynamics of the solution approach in favor of showing some experimental results.

3.2 Experimental Study and Results

We performed experiments to study the performance of the RO approach on a set of 60 projects with 10 activities and 3 modes that were taken from the PSPLIB library of projects [31]. Each project included two types of resources. We apply uncertainty on one mode, randomly, and used a budgeted uncertainty set.

We assume that each activity duration j performed in mode m_j has a nominal \hat{d}_{jm_j} value, and a maximal deviation denoted by $\hat{d}_{jm_j}^{\%}$. Given an optimal mode combination $m^{*t} = (m_1^{*t}, \dots, m_n^{*t})$, the uncertainty set is defined as:

$$\theta_{m^{*t}} = \{d_{jm_j^{*t}} \mid j \in V, d_{jm_j^{*t}} = \hat{d}_{jm_j^{*t}} + \xi_j \hat{d}_{jm_j^{*t}}^{\%}, 0 \leq \xi_j \leq 1, \sum_{j \in V} \xi_j \leq \Gamma\}.$$

For each of the 60 projects we generated 100 streams of activity durations (scenarios). Each scenario was solved by applying three policies: 1) deterministic (DP) generated by solving the deterministic MRCPSPP using the nominal activity durations; 2) a robust policy (RP) as detailed earlier, and 3) a utopian policy (UP), in which the decision maker is assumed to be a prophet who knows, in advance, the duration realizations—thus this policy yields the best possible solutions.

The base case was set to an uncertainty level of 70% at the activity level, that is $\hat{d}_{jm_j}^{\%} = 0.7 \hat{d}_{jm_j^{*t}}$, $\forall j, m_j$, a budget parameter $\Gamma = 5$, and a left-skewed beta distribution. The average time to find RP solutions is 1780 seconds. As expected, the average RP project makespan is longer than the DP (25.2 compared to 23.9 time units, 5.4%); however, due dates set by RP planning will never be exceeded. The average worst case duration was longer for DP than for RP (26.0 vs. 28.0 time units), which is explained by the fact that RP is designed to assure a minimal worst case duration.

The price of robustness, that is the average difference between RP to UP, and DP to UP, is 2.4% and 5% respectively, indicating superior RP performance compared to DP.

Raising the uncertainty level (we experimented with uncertainty levels of 0.5, 0.7 and 1), increases the advantage of RP vs. DP. We changed the level of conservatism using budget parameter, Γ , values of 1, 3, 5 and 10. Setting budget parameters to high values (e.g., $\Gamma \rightarrow n$) leads to a conservative planning, and as it decreases, RP solutions become less conservative.

We also checked the effect of the distribution shape. RP performs best compared to DP when activity delays are frequent (left-skewed distributions). For symmetric and right-skewed activity durations, decision makers should control (decrease) the budget parameter or RP will be too conservative.

4 Conclusions

In this paper, we focus on the strategic and tactical decisions of a project. Strategic decisions concern a project's technical configuration, performance and value; tactical decisions deal with resource allocations, schedules and cost.

The suggested models help in front-end planning.

The first model extends the MRCPSP [32] by setting design modes that include value aspects. We develop a genetic algorithm to solve the extended, NP-Hard, MRCPSP problem—its solution forms a project plan. Then we develop an efficient frontier of plans, each achieving the maximum value for its cost. The decision maker selects his/her favorable plan.

The second model deals with the stochastic MRCPSP and aims to minimize the worst case project's makespan. For this we use an RO approach with polyhedral uncertainty sets, without assuming knowledge about the probability distribution functions of activity durations. An exact solution approach guarantees meeting a project's deadline for all realizations within the uncertainty set. Experiments demonstrate that the robust approach is worthwhile and superior with respect to a deterministic approach when delays are expected. In other words, the makespans are relatively close to their corresponding utopian makespans (<7%) and the deadline is never exceeded.

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Model-based Instrumented Workshops

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To convey recent research from the MIT and U Tokyo Global Teamwork Lab (GTL) on teamwork across the strategy-implementation gap, three hands-on workshops were conducted on the second day of the symposium. These workshops combined three important research ingredients: systems models which connect implementation decisions to dynamics driving emergent strategic outcomes, interactive simulation so that stakeholders can explore these options while in dialogue, and instrumented teamwork, so that the attentions, decisions, reactions, interactions, and convergence of teams can be detected in real time and studied experimentally.

Workshop A: Model-based strategy for a marine fuel & logistics system

Participants worked in teams to design & visualize marine fuel & shipping infrastructure, based on different strategies. The dynamic interface provided rapid simulation & visualization as teams explored a range of key decisions, combinations leading to multi-dimensional impact. Participants took the role of a shipping company operating from Japan to the Middle East, seeking strategy to manage LNG technology adoption and optimize shipping efficiency while improving environmental performance. In the workshop, participants were asked: How should one collaborate to balance new & upcoming emissions regulations with different business priorities? How will models & simulations influence your strategy-making? The maritime system platform was instrumented to collect data on strategy teams in action, and understand their exploration of a complex tradespace.



Workshop B: Project Design: Model-based Implementation for Strategic Dialogue

Participants worked in teams to re-design a product development initiative for autonomous vehicles. Using a model of project and agent-based simulations, the teams explored the interplay of strategy and implementation. In this model-based project approach, the plan of a project integrates a system of product, process, and organization. Teams search and make choices towards a desirable and feasible project, while predicting likely Cost, Schedule, and Scope at some Risk. By observing (through instrumentation) the actions and interactions of teams, GTL asks “How do teams pay attention, develop awareness, interact, make decisions, and eventually explore a tradespace? Can we see the underlying teamwork phenomena that will help us to explain and design projects for better performance?”



Workshop C: Augmenting Strategy with Interactive Simulation

Participants learn about and use various interactive simulation tools to augment decision making and teamwork. In one exercise (30 min) teams use data from a dynamic, real-time simulation engine, called Driving Futures, to support and present their vision for shared and autonomous vehicles into the future. In a second exercise (60 min), teams play a turn-based strategy game, called PharmaScope,” to simulate decisions faced by a pharmaceutical executive allocating manufacturing capacity for various products over many years. The latter simulation will be instrumented to produce user data and demonstrate ways we can compare team behavior and performance.



Posters

Organization	Poster Title
MIT	Demystifying the U.S. Army's Human Dimension Strategy
	Strategy formulation and implementation V
	Rakuten ecommerce platform strategy
	Co-Creation of Strategy and Implementation for Digitized Energy Grid
	Connect Strategy and Implementation w/ Dynamic Work Design and Visual Mgmt.
	Investment strategies for investment in technologies helping AR/VR
National Maritime Research Institute, Japan	Co-Creation of Survival Strategy for Japanese Shipbuilders with Stakeholders
T.U. Denmark	Wrong, but not failed: Design principles for resilient strategy implementation
	Getting the timing right: Simple rules to time strategy execution under uncertainty
	Reification and brokers in strategy implementation: A recipe for buy-in
	Design Thinking in strategy work
University of Tokyo	Electric Vehicle Systems Strategy supported by Actual Data
	Strategy in Implementation through Flexibility in Maritime Capacity

13

The Responsive Dynamic: Structural Features Linked to Decision-Making and Information Processing

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We must increasingly address the ability to respond to abrupt events in highly dynamic and complex environments, which arguably depends on proper decision structures and information processing capabilities. Sustainable performance derives from interactive decision-making that deals with threats and opportunities as they emerge supported by updated environmental analytics. The combination of experiential insights from decentralized responses and forward-looking reasoning at the center identifies a dynamic adaptive system of interacting fast and slow information processes. The fast information is observed from local experiences and the slow information processing interprets these insights and reasons about future developments. The fast and slow processes can interact to form a dynamic system that helps a social system adapt to the turbulent conditions. The model of fast-slow interaction is a key driver of sustainable adaptation.¹

Introduction

Sustainable performance arguably derives from the ability to commit resources within structures that are conducive to dynamic adaptation with status quo being modified by innovative responses to environmental changes [1][2]. It calls for proactive behaviors combined with economic optimization consistent with concurrent calls for exploration and exploitation [3]. The ability to accommodate emergent responses with a general appreciation for the strategic intent is important to manage complex decision-making processes and the ability to generate superior outcomes [4]. It is associated with a combination of autonomous experimentation at low-level decision nodes and high-level analytical strategic reasoning. The associated information processing processes observe ongoing environmental events, interpret them, and make sense of the evolving changes [5].

The adaptive systems derive from locally dispersed responses to emerging threats and opportunities that generate experiential insights and updated information for higher-level sensemaking. This resonates with organizational becoming and a gradual move towards institutional frames for coordination of skills, delegation of authority and joint problem-solving away from formal hierarchies [6][7]. These perspectives underpin a dynamic responsiveness model.

We first introduce the idea of fast and slow information processing as a necessary precursor for effective dynamic responses and adaptive organizations and societies. These interactive approaches are outlined using insights from modern cognitive science and the implications for organizations and societies are discussed.

Background

Human cognition is constituted by fast actions and reactions to them and slow processes interpreting the insights gained from these fast encounters [8]. The combination of fast and slow information processing develops our understanding of the evolving environment and gives meaning to activities carried out. The reactions observed around fast responsive actions are interpreted in analytical forward-looking time-consuming and hence slow thought processes. The interaction between fast and slow information creates a dynamic between insights from dispersed observations and updated higher-level understanding of the context [9]. This system illustrates the importance of interactions between dispersed individuals operating in the field and centrally located interpreters and analysts. The many individuals that execute the daily activities observe the environmental changes first-hand and these impressions can be transmitted to the central forward-looking analysts to better understand how things are evolving.

This is reflected in the concept of interactive strategy-making with elements of central planning and decentralized responses [10]. Strategy-making is often conceived as recurring activities of planning, execution and control depicting a rational analytical approach to develop strategic direction for future activities [11]. It consists of setting long-term goals, conducting environmental analyses, developing action plans and monitoring outcomes.

A cyclical diagnostic control process implies high-level activities around top management to reason about the strategic direction based on analyses of the environment and periodic performance outcomes, whereas the actual execution is carried out by lower-level managers and operational employees who may be able to experiment as things change. The insights generated from dispersed actions can inform top management about what seems to work, and what does not, thereby creating timely information about ongoing changes.

Hence, the fast local responses should interact with the slow forward-looking thinking at the center and vice versa to ensure that the slow thinking process deliberates on the basis of current information. The slow thinking process can develop a more informed understanding about the changing environment based on updated insights from the field [12]. This interactive strategic thinking process can be interpreted as a discourse that forms a common understanding of the environment and guides ongoing decisions [13].

The combined fast and slow processes can create a dynamic system that forms the ability to respond and adapt. The system is meta-stable and displays continuous movement [14]. This dynamic can drive activities towards responsive moves in new thoughtful directions that

adapt current ways of operating in line with the changing context. An interactive structure that combines slow forward-looking reasoning with local insights from dispersed responses can form a dynamic adaptive system with effective response capabilities [15].

The Need for Connected Systems

The left hemisphere of the human brain is seen as the location for many aspects of slow information processing whereas the right hemisphere is associated with fast information processing. So, it is noted that “in cases where the right hemisphere is damaged, we see a range of clinically similar problems to those found in schizophrenia” [16]. Schizophrenia appears to be associated with an imbalance in favor of the slow system that no longer receives updated insights from the fast system. This kind of information imbalance can also happen in social groups. Even though popular business writings often present analytic leader-driven management approaches this is an exaggeration of reality [17]. Managerial decision makers are prone to many cognitive biases due to information imbalances where they miss the weak signals from within the organization [18].

The contemporary, dynamic, complex industry contexts represent turbulent, irreversible, and non-repetitive environments where conventional linear prediction and time-series models fall short (Figure 1).

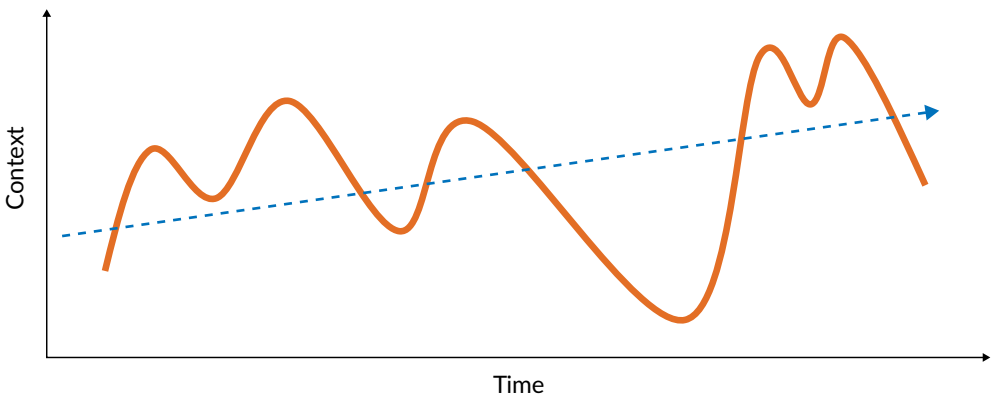


Figure 1: In Turbulent Environments, the Linear Predictions Fall Short

In these contexts there is a need for frequent information updating to understand the changing conditions. The central planning analytics must be informed by current insights from decentralized actions [19]. If this does not happen, the slow system at the center will continue to deliberate on the basis of beliefs from the past.

Fast-Slow Interaction

The interaction between fast and slow information processing provides an active interface between forward thinking and current experiences in the surrounding environment. In social groups the culture, defined as “a set of structures, routines, rules, and norms that guide and constrain behavior,” will influence how the information processes interact [20]. An organizational culture forms as leaders impose certain values on group members, and if these values become invalid by changing conditions, the leaders must enact adaptive change.

The norms and values embedded in the culture influence the way people think and behave and the traits of national cultures influence the way people act in that society. Culture is an inseparable part of human actions. Individuals are shaped by the culture, and in turn, they shape the culture [21], and these human networks can “exhibit complicated, shared behaviors without explicit coordination or awareness” [22]. Cultural neuroscience focuses on how thinking and actions vary according to the culture in specific groups [23]. The implied collective cognitive capabilities of social members can develop distinct and heterogeneous response capabilities across different groups.

A network of communicating individuals can form collective intelligence without formal control [24] where creativity “arises from the synergy of many sources and not only from the mind of a single person” [25]. The innovative behavior depends on creative surroundings with the right stimuli for interacting networked individuals. The involvement of individuals and their ability to take initiatives when conditions change are important elements for the group’s ability to respond and adapt. In contrast, an exclusive top-driven management perspective discards dynamic interaction and hampers a fast-slow information processing dynamic.

Cognitive capability reflects the ability of individuals to learn and use acquired knowledge. In a social context, it relates to the ability to engage in larger integrative initiatives where the consequences in complex situations are beyond the means of the single decision maker. The conditions require other cognitive attributes, such as intense collaboration due to the individual cognitive limitations where the amount of information required to solve highly complex problems exceeds the working memory capacity of single individuals [26].

Cognitive capabilities in social contexts are concerned with individual knowledge acquisition where people store information as *implicit* knowledge based on means-end analysis and experience-based heuristics. It reflects knowing how to handle things on the basis of experience even though it is tacit and cannot be expressed [27]. This works fine when performing routine tasks but there is a need for generalized *explicit* knowledge to deal with unexpected unfamiliar circumstances. This requires access to different types of explicit knowledge to generate non-routine ideas informed by new experiential insights [28]. Hence, the limitation of individual cognition can be curtailed by learning collaboratively, involving people with diverse knowledge and insights [29].

The interaction between slow and fast information processing among individuals in a group is by nature collaborative and thrives on a certain cognitive tension. It needs people where objects are informed by ongoing functional impressions often located in operating entities exposed to the subtle indicators of environmental change. It also needs people who see the surroundings in an analytical way, including general managers and planners who interpret information from a holistic business perspective according to overarching plans.

The functional managers in the local operating entities gain immediate insights from responses taken to ongoing changes in their task environments and can be used to update the forward-looking analytical reasoning of the corporate planners at headquarters. If this information updating is done regularly, the interpretation of the context will be more closely aligned with developments in the environment (Figure 2).

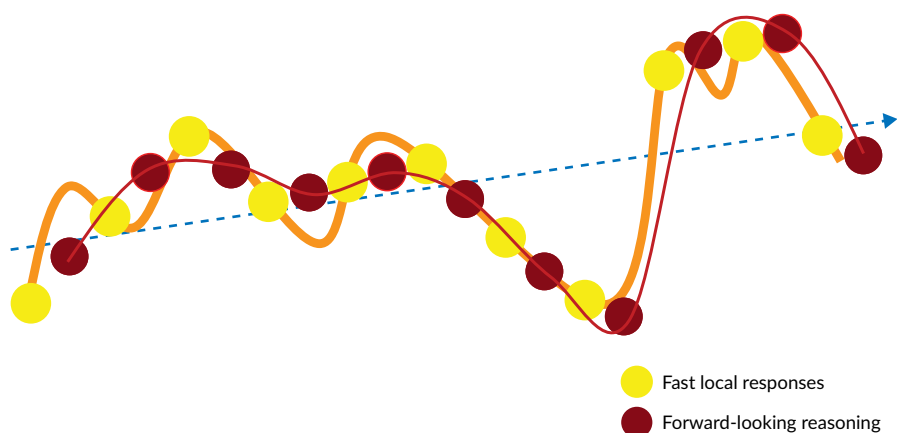


Figure 2. Fast Local Responses can Update Central Strategic Reasoning

Firms that can respond effectively to changes and adapt organizational activities to fit the environmental context will generate higher average returns and display a more stable performance development [30]. Organizations with effective strategic response capabilities display both higher performance and lower performance risk at the same time thereby reflecting inverse risk-return relationships [31].

Individuals in an organization with central analytical planners and decentralized operational actors constitute a dynamic system of slow and fast information processing that resembles the dynamic system of the human brain.

Effective organizational learning under turbulence hinges upon collaborative learning capabilities driven by cultural norms, attitudes and expectations to encourage and inspire ongoing discourse. It involves discussions about decentralized responsive actions with new insights communicated and exchanged among individuals in other parts of the organization including the corporate center.

Cultural Transformation

The adaptive behavior of a human depends on interactions between the nervous system, body and the environment. There is continuous feedback between the nervous system, the body, and the environment. The same adaptive traits have been uncovered in ecological psychology and behavior-based robotics [32]. These traits can be transposed to the social level, where communication and information replace the human nervous system, organization structure resembles the body parts, and various stakeholders constitute the environment. Organizations and societies also present elements of a dynamic information system made up by fast-slow interaction.

Collaborative learning requires that individuals act in a social system with cultural values that influence communication and information exchange. Human behavior must consider these effects of culture [33]. The human interaction also implies that cultural variation arises from learning processes where information is exchanged among individuals in the social system [34]. So, culture forms through the exchange of information between individuals in social transmission mechanisms consisting of knowledge, skills, beliefs, and norms.

Different sub-groups can develop distinct values and lead to unique behaviors that can compete with the behavioral traits of other sub-groups. This is consistent with evolutionary theory where firms compete based on superior routines that can be reorganized in adaptive ways [35]. Here, information is an inheritance mechanism where evolution depends on the ability to interpret the information effectively [36]. A common language allows the explicit knowledge to be stored as general terminologies, definitions, concepts and practices. Communication and information systems drive different cultures that compete by generating evolutionary adaptations.

The cultural traits evolve within sub-groups, and among individuals in other sub-groups, where the socio-economic development derives from gradual accumulation of successive modifications to increase effectiveness. Innovation does not appear as random mutations but is manifested as many small incremental steps [37]. Successful innovation reflects slight modifications to what went before by combining things in new ways. This cultural evolution is an adaptive mechanism and represents a unique human phenomenon.

Collaborative learning is not merely a byproduct of individual learning and social behaviors but captures distinct human mental mechanisms. The sharing of insights from decentralized responses is driven by culture and is an economical way to deal with turbulence where new knowledge and viable solutions are applied elsewhere in adaptive replication. The organizations can decide to engage in learning when this provides better solutions and they can imitate when learning is costly and inaccurate. Hence, the ability to combine fast-slow systems with interactions formed by cultural norms constitutes both efficient and effective adaptation.

Collaborative Learning

Innovation is the evolving property of interacting fast-slow processes where cognition forms through combined processes of slow reasoning and fast actions. Ideas arise from both fast and slow processes whereas judgments derive from slow reasoning. Alternatives are evaluated from reasoning where potential consequences are extrapolated in simulated analysis. Concrete operational actions engage in the fast information processing as responses are taken to deal with observations that contradict initial assumptions. The intuitive sensing of effects from responsive actions is part of the fast information process where the insights can update the slow forward-looking process. This creates the dynamic interaction effects between actions induced by the slow system, immediate actions taken in response to emerging external events, and continuous observations of outcomes in the fast system.

However, individual employees and operational managers rarely act on their own but operate as social beings within an organization as they execute the daily transactions in pursuit of a common purpose. These individuals coordinate their actions through horizontal communication links and receive feedback directly from various involved stakeholders [38]. This ability of individuals within an organization to engage in responsive actions when conditions change is important. As noted by Andy Grove: "The process of adapting to change starts with the employees, who through their daily work, adjust to the new outside forces" [39].

The communication between individuals is important to draw on diverse experiences and knowledge in different parts of an organization or society. The ability to adapt to complex situations requires collaborative efforts between many individuals because the amount of information required to solve highly complex problems is excessive. Dealing with ambiguous situations requires different types of knowledge that can generate ideas and new understanding [40], which is enhanced through collaborative learning.

Creating a Responsive Dynamic

Decentralization enables local exploratory initiatives to uncover better ways of responding to the changing conditions. The strategic planning process can support forward-looking evaluations of opportunities discovered from the dispersed initiatives. The management information and communication systems can make plans and new insights available to all organizational actors. Thereby the central and decentralized strategy-making processes can interact to improve general understanding and development of viable solutions.

The fast processes at the operational level respond to ongoing changes in the local task environment as people engage in experiential learning and discover what may work under the new circumstances. They do things to accommodate the daily routines and use insights from responsive actions to find out what works. In the slow organizational process at the strategic level around top management, people engage in forward-looking reasoning to determine a

proper strategic direction based on rational analysis. This uses available information on trends in demand, competition, technology, regulation, resources, competencies, etc. to assess alternative paths and it should be updated by new insights generated from the responsive initiatives taken in the operating entities.

There is a need for sufficiently high-frequency processes of monitoring and learning to bind the slow-fast processing systems together. Social systems, like organizations and societies, must find a balance between periodic management reporting, sequences of interactive controls, and informal communication. This combination of approaches tailored to the environment will become a winning formula for sustainable adaptation.

Discussion and Conclusion

Individuals in the organization and other stakeholders like customers, suppliers and partners, observe changes and gain new insights from responsive actions. This information should be considered in the central planning deliberations to help interpret emerging conditions based on the updated information. Dynamic interaction between slow-fast information processing creates a balance between identification of the evolving context and collective forward-looking reasoning that gives direction. Social systems that embrace a culture of collaborative learning will deal better with complex situations to form a durable adaptive capacity.

The superiority of interacting fast-slow information processes derives from the logics of interaction dynamics, collaborative learning and cultural networks. Autonomy and individual involvement generate innovative responses to changing conditions. The responsive actions taken by individuals generate experiential insights that can inform central forward-looking reasoning about environmental developments. Collaborative efforts among individuals can deal more effectively with the challenges in turbulent environments.

There is a need for observance from fast responses in lower-level operational functions that can inform the analytical reasoning around high-level decision makers. But, fast local responses should not go without central reasoning. The challenge is to enable a dynamic between the two by structuring things appropriately, allowing for both fast and slow information processing with appropriate communication and information systems in place to facilitate the interaction. In this fast-slow optic, the leadership role is different, as leaders are enablers of effective interactive processes and cultures that support interaction and collaboration.

Decision structures and management information systems are important structural features. Centralization confines decisions to the top echelons while decentralization allows people at lower hierarchical levels to respond. Turbulence forces leaders to consider increasing amounts of information including a multiplicity of knowledge-based competencies [41]. This requires collaborative learning approaches to facilitate better solutions to the complex environmental challenges. Decentralization enables experiential learning from local responses, but there

is also a need to assess development from these insights in slow analytical reasoning at the center. Hence, the dynamic between interacting fast-slow information processes ensures that environmental changes are enacted in the fast information process and their consequences are assessed in the slow information process.

The fast-slow systems thinking from cognitive science provides a foundation to understand the human processes in social contexts of organizations and societies as necessary underpinnings for dynamic capabilities. The ability to engage in decentralized responses is an economical way to experiment in uncertain environments through small low-cost probes searching for new solutions. The slow analytical information process in turn provides the means to evaluate the effectiveness of various probes and thereby convert those that work into larger initiatives where coordinated actions increase the stakes for success. In short, the interaction between fast and slow information processing in social systems constitutes an effective way to respond and adapt to ongoing changes in highly complex environments that require new innovative solutions.

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Endnotes

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14

Sloppy goals and objectives: Lethal to Strategy Implementation

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*The core idea of strategy is to do something. The doing is **implementation**. Our hypotheses are that properly framed goals and objectives significantly enable the effectiveness of doing. And that conversely, sloppy goals and objectives dramatically exacerbate the strategy-to-implementation gap. Therefore, the central theme of this article is **how** to systematically specify clear goals and objectives, to avoid fomenting implementation gaps. To that end, we present a systematic process to specify clear goals and objectives. We also specify **normative principles** that inform decision makers of the sociotechnical context, variables and conditions of strategy and implementation. We discuss these **principles** and argue their importance to sensemaking [1], [2] strategy, and associated sociotechnical operations.*

Introduction

I was reading Alice in Wonderland to my grandkids last week. The passage below was part of the story. Alice asks the Cheshire Cat which road to take:

“That depends a good deal on where you want to get to,” said the Cat.

“I don’t much care where—” said Alice.

“Then it doesn’t matter which way you go,” said the Cat.

“—so long as I get SOMEWHERE,” Alice added as an explanation.

“Oh, you’re sure to do that,” said the Cat, “if you only walk long enough.”

My grandkids giggled and thought this was a very amusing conversation between Alice and the Cat. However, the story is much deeper than meets the eye. The moral of this story is a very appropriate theme for this article.

The conversation between Alice and the Cat is immeasurably more profound than a children’s story. It is a metaphor about strategy and implementation. Namely, where you want to go must be specified as a destination. The destination identifies the goal of the journey; it is the *sine qua non* part of the journey. Similarly, every strategy must specify a goal. While widely acknowledged that goals are needed, much less understood is how to systematically frame and specify them. This is a fatal mistake because poorly framed goals aggravate the gap between strategy and implementation. Moreover, the pervasive habit of conflating the terms of goals and objectives worsens this gap.

What is a goal and how to frame goals?

A goal is a declaration of intent, an assertion of where and what we want to be after exerting energy and effort. Most importantly, a goal is something that is desirable; that which we want more of, and that we do not want less of. Hence, a goal is a “thing for which an effort is made” [3]. It is something desired, which cannot be instantaneously gratified. Something that takes resources, competency, determination, effort, and time. “Goals are long-term aims you want to accomplish” [4]. At an ontological level, a goal is also “an overarching principle that guides decision-making” [5]. Goals, as sociotechnical instruments, are “boundary objects” that communicate intent and commitment [6]. Simply stated in the vernacular, a goal is a **“what”**, i.e. what we want, what we desire. At this specific level of analysis and abstraction, a goal is superordinate [7]. Examples of goals are: become a cultured person, become a profitable enterprise, remain the leader in a chosen domain, have highest share in a selected market segment, expand market share, reduce waste to improve profit, and so on. All these are declarations of explicit aspirations.

The goal specified by President Franklin Delano Roosevelt in 1941, in anticipation of a world war, is a brilliant example of a clear declaration of goals. As the leader of the “arsenal of the free world,” there is no ambiguity or vagueness of what he intends to do or how he will do it. There are very few things, in the world, that demand a more firm determination and resolute commitment of blood and treasure than warfare. Therefore, reflecting on Roosevelt’s example offers us a unique perspective into the structure and meaning of goals and objectives. Moreover, we have history to authenticate and reflect on the strengths and weaknesses of our reasoning. Roosevelt’s strategy for military victory was documented as: “1. Defeat Germany, then Japan. 2. ... by airpower alone, failing that prepare the way for a land invasion of the Continent (then Japan). 3. Prepare the way for an invasion of the Continent; then defeat Germany through airland [sic] operations against the enemy army (with similar operations to follow in the Pacific) [8].” While acknowledging and requiring that: “1. Be popular with the public, 2. Inexpensive, 3. Have a low profile, 4. Low casualties, 5. Quick victory with minimum effort.”

“

We did not know or presume what it was that these firms did uniquely or differently than others.

”

First, consider the syntactic structure of Roosevelt's goal statement. We parse it using our variation of Crawley's et al. canonical form for specifying goals [9], [10]. The canonical form is:

Canonical form for Goals and Objectives

to	declaration of intent, of an aspiration. This is a <i>what</i> .
by	statement of means. These are the <i>how's</i> .
using	assets that are brought to bear. These are the <i>with's</i> .
subject to	constraints/assumptions. These are the unremovable <i>must's</i> .

Therefore, Roosevelt's goal can be framed as follows:

FDR's Goals and Objectives

to	defeat Germany, then Japan
by	by airpower alone, and failing that ...
using	invasion of the Continent and Japan, and airland [sic] operations
subject to	maintaining public popularity, inexpensive, low profile, low casualties, quick victory with minimum effort.

We note that specificity increases from **to** downwards, while simultaneously, abstraction attenuates. The objectives are embedded in the **by** declaration. We note also that this canonical form is the sociotechnical analog of the Operations Research-constrained optimization formulation.

What are objectives?

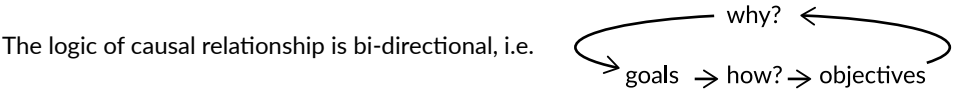
Whereas a goal is a *what*, an objective is a *how*. And whereas a goal is superordinate, an objective is subordinate. The objectives answer the question of "how?". "Objectives are specific, actionable subordinate steps that are taken to meet the goal" [1]. The *how* is specifically identified in the specification using nouns. Objectives are also defined as "concrete attainments that can be achieved by following a certain number of steps" [2].

Therefore, the relationship between goal and objectives is as shown below:

goals → how? → objectives.

In Roosevelt’s example of the canonical form, the **what** is “defeat Germany, then Japan”. The **how** is “by airpower alone”. Simultaneously, in the reverse direction; the question, of “why?” is answered by its antecedent goal. We can derive the goals from objectives, by asking “why?” i.e.

goals ← why? ← objectives.



Vagueness, ambiguity, and lack of clarity of the cause, effect, and its linkages, are major contributing factors of sloppy statements of goals and objectives. For obvious reasons, this causal bi-directional sequence is known as the *means-ends chain*. Which is why General George C. Marshall, the architect of WW2 victory, famously said:

“ If you get the objectives right, a lieutenant can write the strategy. ”


Meaning that, the clarity of the objectives must be so lucid that the implementer not only knows *what* needs to be done, but also knows precisely *why* it must be done. This kind of clarity can meaningfully eliminate the **gap** between strategy and implementation. This level of *reciprocal* clarity significantly reduces the **impedance** between strategy and implementation.

Real world example from G.E.

This example comes from a superb article by Hsu and Krauss titled “G.E. Says It Will Slash Jobs Over Shift in Energy Market.” It appeared in the New York Times on 7 December 2017. The article reports the goals and objectives “to turn G.E. around.” We will parse and summarize the article in our canonical form (table below). Then we will discuss fundamental normative principles for systematically specifying correct goals and objectives. **All** the text below, in italics, is taken directly from the article. We only changed the verbs from the infinitive to gerunds, to improve readability. Finally, we eschew the obligatory quotation marks to reduce visual clutter.

We note the appearance of the “situational context” specification in the table. The situational context specifies the sociotechnical setting of the goal statement. This is critical to sensemaking [1], [2]. The situational conditions implicitly identify and explicitly render the unit of analysis. The situational setting is crucially important to understand the sociotechnical context and the boundaries, within which the goal and the problem/opportunity are situated.

GE's goals and objects for a turnaround

	situational context	<ul style="list-style-type: none">• stock has plunged than 40% decline this year [2017]• steep decline in profit for the third quarter• misjudged the market• significant price pressure• pile of excess inventory
	goal to	<ul style="list-style-type: none">• remake the company ... eliminate boat
	by	<ul style="list-style-type: none">• focusing on energy, health care, aviation• carving out a space in renewable energy• shedding \$20B in assets• cutting expenditures
	using	<ul style="list-style-type: none">• wind turbines• light bulbs, locomotives, Baker Hughes, & underperforming [units]• less capital• cuts in dividends
	subject to	<ul style="list-style-type: none">• cutting 12000 jobs• departing from past empire building• more financial discipline

To obtain the situational context one simply has to pose the “**why?**” question and move up the means-end chain. Clearly, we can climb to the next higher level and ask “**why?**” once more. The answer to that question is necessarily more abstract. Domain knowledge suggests that the answer to this higher-level “**why?**” is reasonably something like “make G.E. profitable again.”

Appropriate understanding of situational settings is important to properly frame goals. Accurate decoding of the situational context is fundamental to establishing the correct conditions and meaning of the goals. In sociotechnical terms, this is what Weick [1] [2] calls **sensemaking**. The context of the strategy must make sense to the stakeholders and problem solvers. Incorrect sensemaking virtually guarantees failure to achieve goals and objectives. Weick describes a tragic firefighting situation, in which flawed sensemaking led to tragic losses of life. Fundamentally, inaccurate sensemaking results in solving the wrong problem and formulating inappropriate goals and objectives. In these cases, the strategy-to-implementation gaps are self-generated and self-imposed disasters.

Sloppy goals and objectives

Strategy goals and objectives are embodied in a boundary object [6], [8], which transmits information and knowledge across organizational boundaries. Unfortunately, they are frequently **sloppy**. They are sloppy because they fail required syntactic, semantic, and pragmatic criteria of meaningful boundary objects. Most lethal is that poorly and unthoughtfully formed goals and objectives foment the strategy-to-implementation gap.

The *to-by-using-subject to* canonical form specifies syntax. The most common *syntactic* error is to only specify the **to** clause and leave the remainder of the specification unstated. This kind of sloppiness leaves too much unstated; thus, creating opportunities for the creation and expansions of the implementation gap. A second source of sloppiness are *semantic* errors in the specification. Namely, although the syntax may follow the canonical form, the meaning of the goals and objectives does not make sense. For example, “The flea is solving a differential equation” is syntactically correct, but absurd. It makes no sense. Though this example is extreme, it illustrates a semantic error. Semantic carelessness is a precursor to unintended and erroneous interpretations and misunderstandings, of goals and objectives that introduce strategy-to-implementation gaps. This is what Weick’s analysis, of the tragic Mann Gulch disaster, called flawed sensemaking. Another example is Tang’s et al. example of Honda’s interior design [7]. Honda’s engineers followed exactly the design syntax specified by the engineering group, but failed to understand the system and usability contexts of the specifications. The engineering specification did not improve the driving experience. Honda did the wrong thing very well. A third contributor to sloppiness is *pragmatic* errors. In this case the goals and objectives, combined with the organizational knowledge and processes, are collectively insufficient to jointly transform what they know and resources they have into effective implementations.

Sloppy goals and objectives are clear indicators of sloppy and careless thinking. Finally, a fourth contributor to sloppiness are failures to adhere to fundamental normative principles of goals and objectives. Normative principles are what we discuss next.

Principle of excluded reductionism

“Top managers cannot possess all the knowledge that the various individuals in an organization have about their task environment. It is more effective to specify goals and selection criteria and allow lower-level employees to find the best solution to their particular task. [11]

”

At any unit of analysis, goals and objectives are set by the leaders of an organization who are responsible and accountable for the production of the intended outcomes. To that end, they have also been delegated the power and resources to achieve specified goals and objectives. But, organizational leaders cannot personally perform all the required tasks to meet the specified goals. They must depend on designated organizations to implement and execute. Each of these organizational units is an action system, an operational system of specialized skills such that the sociotechnical ensemble can achieve the specified goals in the context of the situational setting. For complex sociotechnical problems, Simon [12], [13] first articulated the principle of *near-decomposability*, which states that problems can be decomposed into a collection of nearly-linear interacting subproblems. This explains the widely used hierarchical organizational structure in the military, business, and other enterprises large and small. Consistent with Simon’s principle, the normative-principle of *excluded reductionism*, of Ropohl [14], states

that objectives should be distributed among the manager's direct reports to implement. This principle ensures that goals and objectives are actionable, without any gaps, by sociotechnical units designated to execute and produce results.

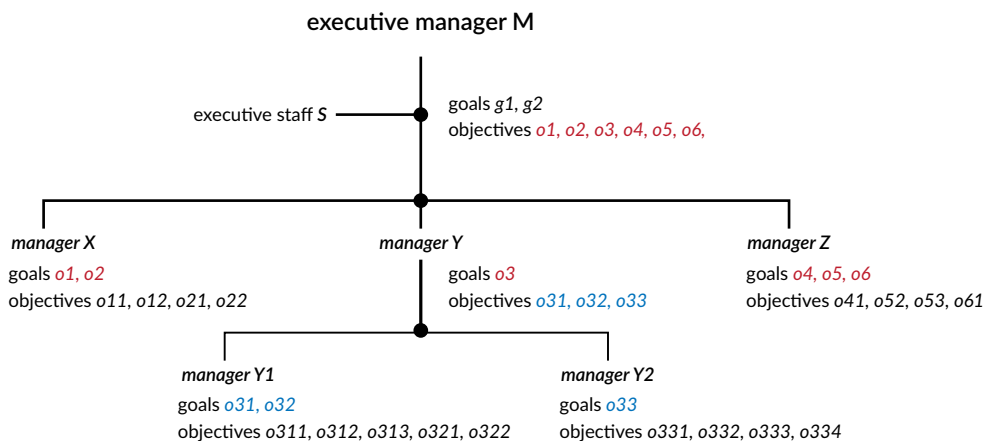
Principle of hereditary propagation

Goals and objectives are meaningless unless **they propagate effectively downwards** throughout the organizations responsible for implementation. Goals and objectives are *inherited* by the lower implementation units under the person that is responsible for attainment of goals and objectives. Inheritance must not omit any goals and objectives in the process. For sociotechnical systems, the efficacy of this inheritance is not automatic. For sociotechnical systems, no equivalent of the laws of physics exists that ensures complete propagation. Any physics-like properties, such as predictable consistency, must be achieved by sociotechnical intent and design. Sociotechnical achievements are not automatic like magnets attracting iron. *Au contraire*, they are only obtained by organizational design and organizational processes.

Goals and objectives are necessarily contextually positioned in an organizational structure. That level can be as high as the CEO of a business enterprise, a junior executive, or a first-line manager. That person, **M**, is the one responsible **and** accountable for the achievement of goals and objectives. Say that **M** has prescribed:

the strategy goals by the set **{g1, g2}**,
and the objectives to attain these goals by **{o1, o2, o3, o4, o5, o6}**.

And let us assume, without loss of generality, that the senior manager has three direct reports, **X, Y, and Z**. And that **Y** has two direct reports **Y1 and Y2**.



Applying the management principle of *excluded reductionism* of complex organizational structures, say that the objectives are partitioned to managers **X**, **Y**, and **Z**. The objectives { **o1**, **o2** } are delegated as goals to **X**, the objective { **o3** } is delegated to **Y**, and { **o4**, **o5**, **o6** } are delegated to **Z**. Note that the objectives at the level of **M** become the goals at the level of **X**, **Y**, and **Z**. And the objectives at the level of **Y**, become the goals at the level of **Y1** and **Y2**. This is the *hereditary principle* of goals and objectives, equation (1), i.e.

$$\text{goals } |_{(\text{level } i+1)} \Rightarrow \bigcup_n \text{objectives } |_{(\text{level } i+1)} \qquad \Rightarrow \text{ indicates "derive" } \qquad (1)$$

$$\bigcup_i \text{objectives } |_{(\text{level } i)} \supseteq \bigcup_m \text{goals } |_{(\text{level } i+1)} \qquad \supseteq \text{ indicates "span" } \qquad (2)$$

Moreover, proper application of the hereditary principle requires that the objectives at the next lower level *span* the objectives of its parent, equation (2). Namely they are able to *satisfice* [12], [13] the goals and objectives of its parent, and by implication, its antecedents. We call this the *completeness* criterion. This criterion is a necessary requirement of the *hereditary* normative principle. Absence of *completeness* leaves *gaps* in how to *satisfice* goals, which exacerbate the strategy-to-implementation gap. Hereditary completeness makes correct usage of our canonical form, *recursive*, i.e. an objective at one level of the organization becomes the goal at the next level of the organization. By the principle of *excluded reductionism*, manager **Y** delegates its objectives downwards to managers **Y1** and **Y2**. Heredity and the completeness criterion make the goals and objectives recursively complete.

Principle of synthesis

While adherence to the above principles is necessary, they do not address the operational dynamics that emerge from the sociotechnical system. An analogy from physics illustrates the concept of the principle of synthesis. The operating units of managers **X**, **Y**, and **Z** will naturally have *centrifugal forces* acting on them as a result of inertia. Left unattended, and under extreme conditions, the result is organizational chaos – the left hand does not know what the right hand is doing. What is needed is “adult supervision,” executive control and guidance, to exert a *centripetal force* that pulls them toward the center, viz. in **M**’s direction. As we know, this is not automatic, but demands the managerial *design* of organizational processes. Design is synthesis. Synthesis is the process of disciplined and creative arrangement of pieces so that the ensemble behaves the way we want it to. Synthesis is much more than lumping things together. *It is integrating specialized elemental subunits into a functioning whole according to working principles.* A BMW engine is not a bunch of metal, screws, and electronics thrown together. It is the result of intellectual and creative effort – synthesis. The principle of synthesis concentrates on the operational cohesion and directional consistency of the operational units. No manager will argue that this operational integration is both desirable and necessary. Strategy is synthesis of means-ends, implementation is synthesis of sociotechnical systems and process. The strategy-to-implementation gap is the result of poor synthesis; in the same way that a poor performing engine is the result of poor design. Hence the principle of sociotechnical synthesis.

To address synthesis, what is an organizational design that research and managerial praxis have shown to be effective? A proven approach is picking a small group of experts as a staff function that reports directly to **M**. The members are handpicked for their cross-functional and multidisciplinary experience. Additional requirements are having the right temperament and strong social skills. The group's leader is a seasoned manager or a high-potential manager being groomed for promotion. We identify this person as **S**, for staff. **S**'s job is to monitor, advise, and counsel **X**, **Y**, and **Z**. As such **S** has a dotted-line relationship relative to **X**, **Y**, and **Z** that is formalized. **S** also has the discretionary power of escalation, i.e. to turn in these managers to **M**, if the situation demands it. **S** may also be responsible for sensitive assignments and studies initiated by **M**. In IBM these positions are used to confirm or groom future leaders. In the military, these positions are called Chief of Staff and they exist at many levels. In the military, Eisenhower, Marshall, Moltke, Berthier stand out as exemplars. For small groups like **Y**, the manager itself can take on the role of staff.

Scholars and experts recommend the practice of the organizational synthesis principle because it is effective in linking together different operating units [15]. Implementation of strategy demands thoughtful adherence to the synthesis principle.

Principle of feasible actionability

All these normative principles, notwithstanding, are meaningless and useless, unless the goals and objectives are **feasible and actionable**. Feasibility is a critical test that must be met [16]. Hence, it is presented as a principle. Feasibility seeks to answer the critical question: "Given the physical and non-physical sociotechnical resources of the organization, can the strategy be implemented and are its goals and objectives achievable? Why or why not?" Actionability means that we can present a recipe that an organization can reproduce with repeatable results.

Clearly, the possibility of strategy-to-implementation gaps motivates this principle. The extant literature reflects a bias of scholars and practitioners. Namely, they prefer the approach that seeks to demonstrate that a strategy **can** achieve its goals and objectives – by market, by product, by technology, by manufacturing, by financial resources, by supply chain, by distribution, by service, by human resources, and so on, and so on, e.g. [16]. This process is almost like being canonized by the Pope. The process is motivated to guarantee a perfect and immaculate strategy. It is a labor-intensive, costly, and protracted, albeit excruciatingly thorough.

Instead of thinking how the strategy, goals and objectives **can** be achieved **perfectly**, we propose to think about the reasons why the strategy, goals and objectives **cannot** be achieved. This turns the focus on *finding* the causes of **why** a strategy **cannot achieve** its intended outcomes. The logic is similar to that in medicine. Instead of lectures on perfect health to a very sick patient, focus instead on finding why a patient is sick. Our approach places *variables and conditions* that *drive failure*, and their linkages to the strategy-to-implementation gaps, at the core of feasibility. These variables and conditions we call the **impedance**, obviously

because they impede the efficiency and efficacy of strategy-to-implementation efforts. We call these two orthogonal approaches the **can** and the **cannot** approaches to feasibility. As in diagnosing a sick patient, we concentrate on the causes of the sickness. We have confidence that our approach on focusing on the disease of the strategy will shed new insight into the strategy-to-implementation gap. For example, a perfect strategy will fail if led by a wishy-washy executive. The overwhelming majority of can-approaches assume the existence of decisive executives. Our experience is that many managers are risk-averse and indecisive. To disguise their indecisiveness, they will demand more time, more analysis, additional data, more reviews, broader participation to share blame, focus on tradition and precedents, and so on. In these cases, the strategy-to-implementation gap is self-imposed and self-generated from the onset.

Therefore, concentrating on the diagnosis of unfeasibility, why a strategy cannot succeed, is a useful way to gain insight to the root causes of the strategy-to-implementation gap.

Summary

Sloppy specification, of goals and objectives, cannot be tolerated. Unclear goals and objectives are time bombs planted in the sociotechnical implementation system. Therefore, sloppy goals, from the onset of the strategy effort, are creating strategy-to-implementation gaps.

In the vernacular, a goal is “what” we want. An objective is “how” to get what we want.

The **to-by-using-subject to** canonical form is a rigorous and practical syntactic framework. It provides a systematic way to declare goals and objectives.

Syntactic rigor is necessary, but not sufficient. Semantic and pragmatic normative principles are also needed. One is the complete hereditary propagation principle, which safeguards against gaps in the delegation of strategy-to-implementation tasks.

Another principle is that of near-decomposability and excluded reductionism to ensure systematic decomposition of goals and objectives throughout the organization. The synthesis principle ensures that operational units remain aligned in the same direction.

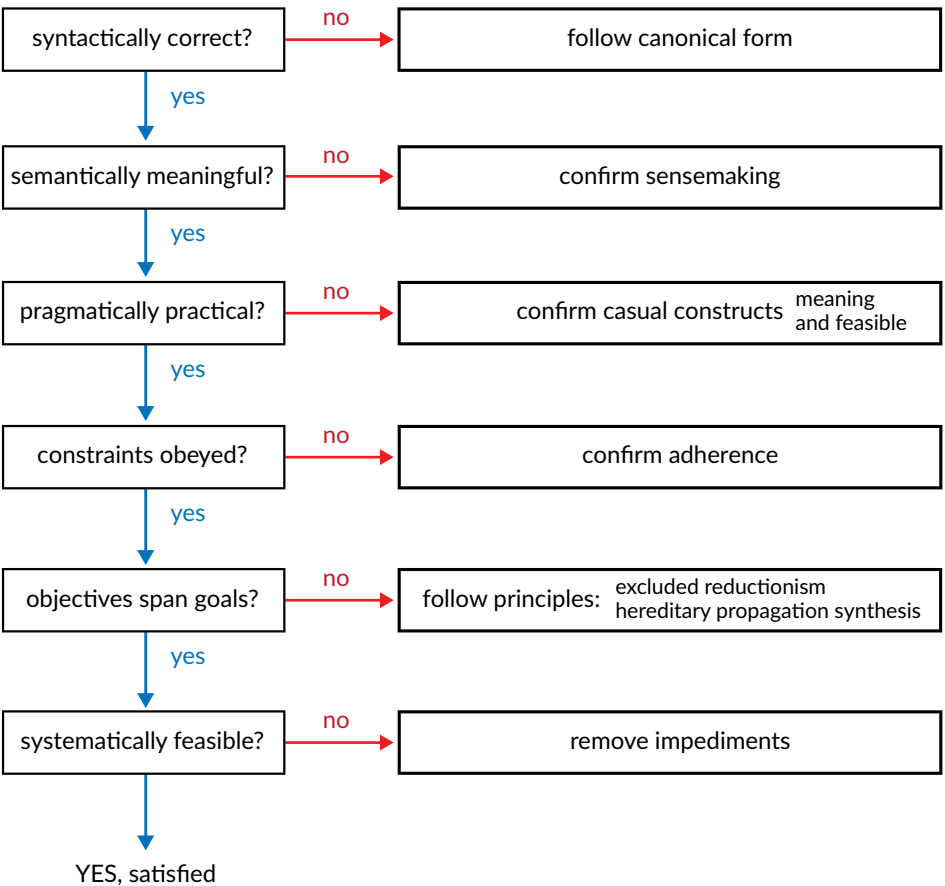
Finally, all these principles, notwithstanding, are meaningless unless the strategy, its goals and objectives are not feasible and actionable. Hence, the feasibility principle.

We depart from the conventional wisdom, which seeks to specify a perfect strategy and to then confirm that it **can achieve** its goals and objectives. We prefer to focus on the reasons and conditions why the strategy, goals and objectives **cannot** be achieved. This turns the focus to why a strategy can be **defeated**. This approach places *variables and conditions* that drive the formation of strategy-to-implementation gaps, at the core of feasibility. We call these variables and conditions the **impedances** of strategy-to-implementation.

A graphical summary of the ideas in this article are presented below.

specification of goals & objectives

prescriptive remediation



Finally, the Cheshire Cat could simply have answered Alice as follows:

$$\begin{aligned} \text{goals } |_{(\text{level } i+1)} &\Rightarrow \bigcup_n \text{objectives } |_{(\text{level } i+1)} \\ \bigcup_i \text{objectives } |_{(\text{level } i)} &\supseteq \bigcup_m \text{goals } |_{(\text{level } i+1)} \end{aligned}$$

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15

Navigating Strategy-to-Implementation with Distinctive Capabilities

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The paper draws on a previous research study, which was based on executive interviews about their firm's execution of strategy, to develop the concept of distinctive capabilities for guiding strategy and its implementation. We propose that companies and their leaders adopt a focus on distinctive capabilities to part of their approach to strategy because it encompasses both goals (ends) and communicates how that strategy and those goals are to be achieved (means). Specifying both these ends and their means provides greater guidance to enable better alignment across organizations for more successful implementation of strategies. The proposition for more extensive use of distinctive capabilities is based on insights that come from reflecting on the assumptions and approach to this strategy research.

Introduction

What guides you and your firm to achieve the results you desire? What is your goal and what do you do to achieve it? These are the important questions that form the basis of strategy, and the foundation for its implementation. Formulating strategy involves leaders' thinking and decision-making to provide direction to others, and implementing strategy arises from how others' actions are guided by the direction they are given.

Surveys find that the majority of leaders struggle in guiding their firm's efforts to both develop great strategies and implement them. While some firms are seen as great at one or the other – either formulating strategies or leading the programs, efforts and activities that implement them – few, less than ten percent, are reported to be great at both [1] [2]. Hence, this difficulty of strategy formulation and implementation creates a strategy-to-implementation gap. To effectively manage the efforts that traverse from a strategy to its implementation, and “close” a strategy-to-implementation gap, we propose “distinctive capabilities” as a concept for the development and guidance of strategy and its implementation. We propose “distinctive capabilities” be used as both a concept that provides strategic direction and an approach to organizing and guiding implementation activities to achieve desired results.

Briefly, a “distinctive capability” is a dynamic combination of processes, knowledge and resources that are selected, developed and cultivated by an organization's leaders and its people to provide a foundation for delivering differentiating and substantial value through its products

and services. High-performing organizations that achieve and sustain industry-leading results developed, aligned and renewed their distinctive capabilities to achieve the performance for which they were recognized. These distinctive capabilities were configurations of people that effectively deployed their skills and knowledge using organizational processes to secure and utilize available assets, facilities and materials to consistently and reliably deliver valued product and service offerings to customers.

To describe the insights into the importance of distinctive capabilities we draw upon a study of companies selected for their abilities to effectively and consistently execute their strategies. By having a focus on developing and utilizing distinctive capabilities these companies avoided implementation issues. To describe and develop these concepts, we review the history of the “capabilities” as concept in the strategy and management literatures, extend that broad concept to what makes for distinctive capabilities, and illustrate how organizations have used the concept to consistently perform at levels that elude their competitors. The interviews, analysis and writing of *Strategy that Works* provides the insights for our proposal that distinctive capabilities are an important concept that is different from current individual, team, or firm organizational units of analysis. We conclude by proposing further applications and research that would guide managers in their use of distinctive capabilities for navigating strategy to its implementation.

Study

The insights in this paper come from a study that involved interviewing executives on their companies’ strategy and performance. The companies were selected based on their market, operational, and financial performance. In the interviews, executives described how they developed capabilities to deliver exceptional value to their customers as an essential part of their product and service offerings. Their efforts were guided by selecting and developing unique and differentiating capabilities, integrating them into a capability system, and leveraging that to provide valued products and services to customers.

Finding and Eliciting Capabilities

The insights for why firms and their leaders should focus on distinctive capabilities came from reflection on the interviews and findings described in *Strategy that Works* [3]. The studies involved large firms, known for their strategy, ability to execute, and consistency in achieving their market and financial performance. These firms avoid any gap in executing their strategy by following five “unconventional practices” – 1) *commit* to a few areas that these firms did best; 2) *build* unique capabilities; 3) *leverage* their culture; 4) *invest* in a few focused areas; and 5) seek to *shape* the future – all of which are described in depth in the book. These managerial practices built upon an insight around distinctive capabilities described in interviews with companies’ executives.

We did not know or presume what it was that these firms did uniquely or differently than others. Rather than asking specific questions, which presume we knew what was most important, we took an informed, inductive approach, asking them what was most important in their efforts in setting and executing their strategy. We created and presented people with artifacts that described their company, its strategy and history, and asked them to describe what was important and what they wanted to talk about.

One of those artifacts was a time line of their company's history. This time line included publicly available information – reported performance, industry and business events, people in leadership positions, and the major programs and strategies – along a chronological continuum. The period covered included the company's history and its performance for the strategy and its execution that we were interested in learning about. An illustration of that time line for Danaher Corporation is shown in Figure 1. The leaders interviewed located themselves and their involvement on that time line and described their role and perspective on the organization, its strategy and execution, and what led to their firm's accomplishments. Any changes or additions to the time line, such as important events to understand in the chronology, were added and used in subsequent interviews. This artifact provided a chronology on the company's history that prompted people's recollections of what happened when, and enabled them to choose events they deemed as important in their involvement, and thus describe activities and what they saw as most important in forming and executing strategy.

The other artifact developed for interviews was a diagram with our assessment of the firm's capabilities. We developed the diagram based on our research into the company, using newspaper and industry trade publications, annual reports, statements to analysts, and other written materials (case studies or book chapters) and so on. The results were also checked with people knowledgeable about the company and its industry. The diagram proposed the company's distinctive capabilities. The capabilities were placed around gears, where the meshing gears signified an interrelationship among capabilities for a capability system. An example of the distinctive capabilities diagram, again for Danaher Corporation, is shown in Figure 2. This diagram, like the time line, was presented in interview and also modified based on comments and suggestions that were made.



Figure 1: Example of Time Line for Danaher interviews [3]

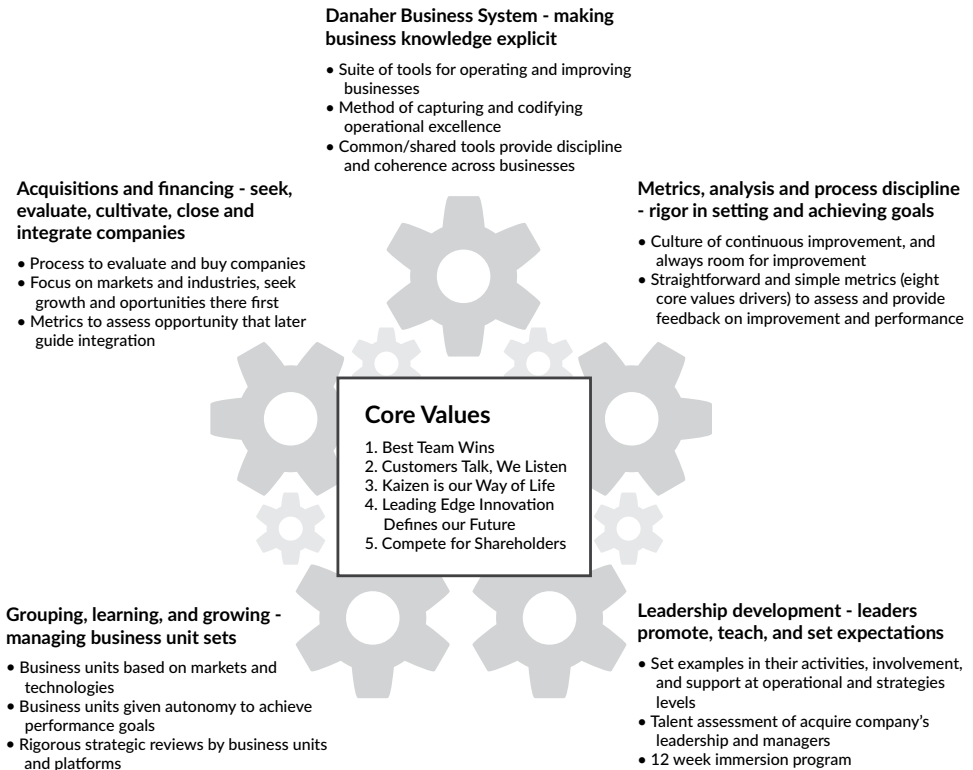


Figure 2: Distinctive Capabilities Diagram as used in Danaher Corporation Interviews [3].

Danaher's Identity Profile

With headquarters in Washington, DC, Danaher is a group of companies that produce industrial components, instruments, and other devices for scientific and technological industries, including the life sciences. Since 1980, its annualized returns to shareholders are three times higher than that of the S&P Industrials Index.

In 2015, Danaher announced a forthcoming split into two companies: one for science and technology products and one for industrial components and related products.

Value Proposition: As a "company that builds companies", this integrator adds value through M&A and operational excellence. These capabilities enable it's member companies to be B2B category leaders, consistently offering high-quality, reliable products and solution in what otherwise would be a diverse group of professional, medical, industrial, and commercial enterprises.

Capabilities system

- **Acquisition and integration:** Danaher succeeds by acquiring and integrating underperforming companies that will thrive with its business system, building a long pipeline of potential transactions to ensure that incoming companies fit with its capability system.
- **Leadership development:** Through this capability, the company engages people in learning sophisticated management practices.
- **Intensive continuous improvement** (the Danaher Business System). Applied across product and company boundaries, this capability drives operational improvement of quality, service, reliability, and cost.
- Danaher's innovation capability is specialized for the development of precision instruments and similar products.

Portfolio of Products and Services: Danaher has grown since the mid-1980s into a conglomerate with almost \$20 billion in annual revenues and forty-one businesses spanning five manufacturing sectors: dental; environmental; industrial technologies; life sciences and diagnostics; and testing and measurement.

Figure 3: Identity Profile for Danaher Corporation as Presented in Strategy that Works [3, p. 147].

We later created a table with those capabilities that was included with writing on each company in *Strategy that Works*, which also included a summary of the company's business, portfolio of products and services, and value proposition. We gave the name "identity profile" to this set of materials; the Danaher identity profile is shown in Figure 3.

Using this inductive approach, we found that the firms profiled in *Strategy that Works* all followed a common approach – the five unconventional acts – for developing and executing their strategy. Our focus in this paper is not on the unconventional acts, but on further exploration of the assumption and focus of the interviews: examining what happens as organizations identify, develop and use distinctive capabilities.

Why a Focus on Distinctive Capabilities?

It appears that developing distinctive capabilities was something that guided managers in their efforts for implementing their firm's strategy. From an academic viewpoint however, it is not clear what distinctive capabilities are and how they develop over time. We therefore first define the concept of distinctive capabilities in order to describe how they can be used to guide the path from strategy formulation to effective implementation.

As a countermovement to Porter's strategy approach of industry positioning as competitive advantage [4] [5], scholars in the 1990s identified organizations' routines as a form of capabilities [6], which provided advantages different from positioning, and thus was linked to firm strategies. They proposed that better routines were what enabled firms' higher performance and survival in competitive environments. The development of routines as providing strategic advantages evolved into what became called the "resource-based view." Firms utilize their specialized knowledge and unique resources to gain and maintain advantage over competitors [7] [8]. When knowledge and resources are scarce, not equally distributed nor easily obtained, firms with similar market positions seek to outperform rivals through the development of their routines and their control over resources and assets. These resources and assets are both tangible and intangible, such as using the firm's knowledge for configuring processes that are scarce resources. The rigid and incomprehensive emphasis on resources as subject of analysis lead to the focus on "capabilities" as the combination of assets, processes and knowledge that determine competitive advantage.

What are Capabilities?

A broad definition of capabilities is the "deployment of resources, usually in combination, using organizational processes, to affect a desired end" [9, p. 35]. Capabilities are an integrating, multilevel, organizing concept; capabilities span resources, knowledge, skills, competence, and processes. Some scholars argue that of these elements, a firm's knowledge is a resource that is its most important asset [10]. Others say that the integration of tangible assets, such

as resources, through intangible assets, such as knowledge, is an essential element of what constitutes capabilities [11]. Prahalad and Hamel's concept of "Core Competence" focuses on a few activities that the organization is particularly good at and therefore drives the performance [12]. However, core capabilities can lead to inertia against adapting to environmental changes [13]. Therefore, Teece et al. introduced the concept of "Dynamic Capabilities" as a second-order capability that allows an organization to sense environmental changes, seize resulting opportunities, and modify its underlying competence base accordingly [14].

Regarding the content of capabilities, there exist at least as many conceptualizations as there are definitions, depending upon the orientation or application (see e.g. [13], [15], [16], [17], [18], [19]). Additionally, given the view that organization capabilities are a potential that can only be observed when performed, assessing and measuring them provides a significant challenge [20]. All together this leaves us to conclude that much of the academic literature provides somewhat inconsistent and unclear guidance for the study or application of capabilities. As such, the priorities for research activities diverge from what is needed by managers, which is a definition and use of capabilities that make it both a valuable and actionable concept in their firms. What is needed in business is the application of capabilities such as those that have been proposed as being "core," which are those that offer clear customer benefits, are difficult to imitate, and enable market access.

Why Capabilities for Strategy Implementation?

How do capabilities relate to an organization's strategy and its implementation? We propose that the multifaceted characteristics of capabilities provide a focus on knowledge, processes, structure and resources for navigating the organization's strategy and its implementation. Strategy and its implementation derives from individual and collective decision-making processes that are communicated to guide subsequent decisions and activities that take place over time across multiple people, teams and organizations. People make choices and then organize and undertake activities over time in their organizations in the context of their business environments. Under uncertain environmental conditions, achieving desired results requires guidance from strategy, alignment of activities across multiple units, and availability of people, materials, and other resources needed to enable those actions. Strategy implementation involves the elements that make up capabilities – people, skills, teams, processes, knowledge, technology, assets, materials and resources. A focus on capabilities involves developing strategy to align these elements to produce valued products and services.

Why Distinctive Capabilities?

Some literature applications discuss the many, perhaps hundreds, of ordinary capabilities that make up the routines and process that undergird an organization. Functional abilities such as supply chain optimization, manufacturing excellence, or talent management, and qualities such

as “adaptability,” “flexibility,” or “agility,” are all necessities in competitive markets. As such, ordinary capabilities and other attributes are the mere “table stakes” needed to survive in competitive industries.

What we are interested in is just the few macro-activities that a firm intends to do and does exceptionally well. We use the term “distinctive capabilities”¹ for what is unique, substantial, and differentiating, what it is that customers value and competitors struggle to match. Distinctive capabilities are differentiating (unique in such a way that it sets the company apart from others) and distinguishing (valued by people in the company, its customers, and others in that industry). Distinctive capabilities are hard to copy, in part because they are specific to the context of the firm and its industry, needing to be developed to fit those precise conditions, complex and expensive as they involve high fixed costs in human capital, tools, and systems, and thus purposefully designed to provide the advantages that they do.

Distinctive capabilities are advanced by strategy and set the company apart from others. While broadly spanning the organization, they are specific, in that they provide a focus on few things that are done at a world-class level. Distinctive capabilities are important and special to the firm’s managers and workers, and evident to its customers. Because they are developed and maintained internally, they seem hidden from outsiders, particularly those that do not know the company or its industry well – it seems that the company does consistently well, but it is hard to discern exactly why that is.

Distinctive capabilities are difficult to measure because they have individual, group and organizational attributes, which include characterizations – such as personalities, norms, routines and cultures – appropriate to each of those levels. People, habits and knowledge, which are soft skills, tacit understanding, and intangible assets, combine with materials, facilities, processes and routines, which are hard assets, explicit knowledge and tangible concepts, to make up distinctive capabilities.

The attraction in utilizing distinctive capabilities is that they provide the broad, appropriately encompassing, multi-level approach needed for organizing people, skills, knowledge, process, and resources to reliably produce unique, valued, and desired outcomes in organizations. A distinctive capability provides the means through which a company achieves the goals and objectives in ways that are both valuable and unique. When a company develops its distinctive capabilities, it connects its strategy (how they differentiate themselves) with their execution (what they do every day), in order to create real and lasting value for customers (what sustains high performance).

Building distinctive capabilities

Building distinctive capabilities – identifying, developing and scaling up – is an organizational activity that requires leaders to link their strategic thinking with guidance for efforts and activities in implementation. That capability connects people, skills, knowledge, organization,

process, assets and resources together with a focus on desired outcomes. A distinctive capability is created through the informed, willful and deliberate choices that guide the actions in creating value for the company and its customers.

Based on the interviews with company leaders and Feiler and Teece’s approach of building dynamic capabilities [21], we describe the capability-building process sequentially, but note that these activities often occurred simultaneously. Figure 4 shows a systems view of the elements in capability building processes. We observed three meta-processes, signified as reinforcing loops. There is the inner process loop for developing and scaling capabilities and an outer two process loops for maturing, aligning and refining capabilities. The inner loop represents the creation of distinctive capabilities, wherein leaders provide direction for what the company does exceptionally well through the capabilities that it selects, develops and scales. The outer maturity loops refine, align or renew the company’s capabilities.

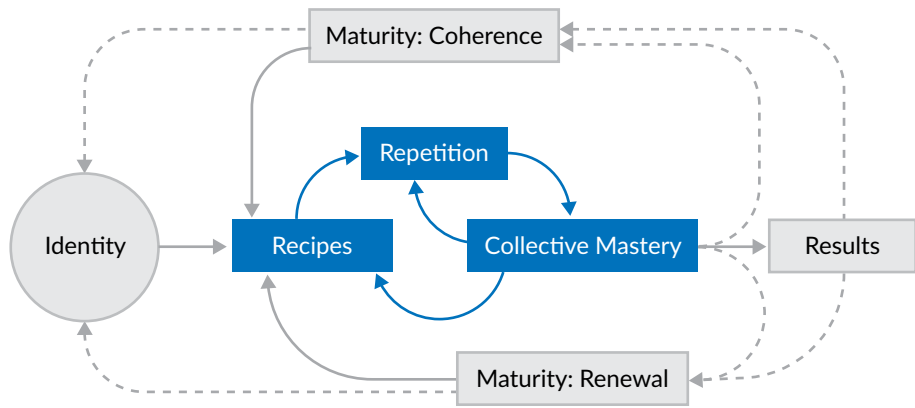


Figure 4: Capability Building Process

A leader’s expression of their organization’s identity creates an anchor for capability building. That identity provides a sense of who the company is and what it does, providing direction for both what the company seeks to accomplish and how it does so. Identity shapes what a company does best, both in terms of what it is externally renowned for and what guides its internal efforts to integrate across sales, design, production, marketing, operations, talent and other functions. That integration involves aligning and organizing the creation, readiness, and use of its distinctive capabilities, including resources, materials, people, reporting structure, processes, skills, knowledge, functional units, and facilities. A clear expression of identity guides work across various departments, facilities, and functions in developing distinctive capabilities as a means to accomplish its desired ends. The process starts small, with tests or pilots that are successful, and then gets scaled.

We use the term “recipes” for the formal and information guidelines that are developed and followed. These recipes are “know-how,” or sets of activities, in the context of people,

knowledge, connections, technology, facilities, and materials, that describe and illustrate how to achieve particular results. Recipes are developed and tested by initially producing results in one area. The company brings capabilities to scale by repeated use, refinement, and teaching of recipes to others. The standard for those outcomes is that they are achieved reliably and efficiently at leading performance, cost and quality levels. Over time, following a recipe is taken for granted and becomes implicit, it becomes “how we do things around here,” and when it is widely known, a “collective mastery” develops. That mastery is maintained by ongoing comparison of actual achievements to expected results. That assessment continues to improve recipes, increase people’s skills, and add to the organization’s knowledge. There is reinforcing feedback for the company’s identity as a distinctive capability creates outcomes that are valued by customers, achievements that are revered in its industry, and becomes a renowned element in its identity.

The building process creates distinctive capabilities, and maturity processes refine and renew them. Attention to the external environment, or how to evolve with customer needs and market conditions, is a part of “renewal.” Renewal is ongoing improvements, seeking to continuously upgrade and achieve and maintain the highest possible performance levels. Renewal may involve significant, even disruptive, changes. It includes abandoning a distinctive capability when it is no longer unique or differentiating. Focusing on new capabilities comes from the recognition that an organization can only do so many things exceptionally well, and that it must choose just those few (cf. [22]).

The other maturity meta-process involves alignment among distinctive capabilities. This “coherence” loop has to do with needing to rely on more than one distinctive capability and building a set of capabilities that complement one another. A company that manages itself around a few distinctive capabilities and integrates them across everything they do creates a focus for its success. Coherence correlates with significant, measurable gross margin and profitability advantages [3]. Companies achieve coherence by following the five unconventional leadership acts, which are proposed as activities that other companies can also follow.

Creating a Capability System

Creating a distinctive capability is a way to align and allocate people, process, technology, assets and resources in and across organizations. Important and powerful capabilities do not stand alone. Successful companies studied in *Strategy That Works* did not just have “a” distinctive capability, rather they combined multiple distinctive capabilities into a “capability system” [3]. Capability integration created conditions identified by economists as complementarities [23], or conditions when doing more for one capability confers benefits to other capabilities. The firms we studied had at least four and a maximum of six distinctive capabilities. Based on this small sample of companies, three to four capabilities seemed sufficient for uniquely creating value. Six seemed to be a pragmatic maximum given the high levels of commitment, attention, and investment needed to develop and maintain world-class performance in each. Integrating

individual distinctive capabilities into a capability system created synergistic benefits, made it harder for other firms to copy them, and further distinguished the company's offerings.

To illustrate the combined effect of a capability system, we see that Danaher's distinctive capabilities, drawing on the information previously presented (see Figure 2), were acquisition and integration, leadership development, and intensive, continuous improvement (i.e. development and use of the renowned Danaher Business System). Danaher's identity as a high-performance-oriented purveyor of scientific and technologically oriented tools and instruments is based on its historical abilities to turn around ailing enterprises using its "Danaher Business System," talent development, and financial management methods.

Support for Distinctive Capabilities and Capability Systems

Interviews with company leaders gave us opportunities to hear how they approached strategy and its execution and what they did. The development of distinctive capabilities and a capabilities system, unique to their company, was a deliberate activity they guided that involved the organization's management and people. Leaders described their actions, but were often unaware of the terms or literature on capabilities. In reflecting on selecting and interviewing organizations identified by the efforts around capabilities, we propose several social science research findings that align with what we heard. There are four points for what we have found in studying distinctive capabilities.

Table 1: Implications of Distinctive Capabilities for Navigating Strategy-to-Implementation

The first finding is that distinctive capabilities provide a "requisite" attention that is needed to guide the thinking and action of an organization's leadership, management and people. An orientation to selecting, developing, scaling and maintaining distinctive capabilities guided efforts in implementing strategy. Distinctive capabilities focus attention to the necessary and essential elements for organizing – thinking and action at individual, unit and organizational levels – to go beyond the "what" or desired ends and include the "how" or means for achieving those ends. Distinctive capabilities are inclusive of these means, or the "who" and "how," for achieving strategic goals. When given this guidance, the people in these organizations were better able to coordinate and navigate strategy to its implementation because they had a more complete picture of how they were to organize their efforts and draw upon resources.

Second is the broad engagement that developing distinctive capabilities create for people across multiple organizational levels and functions. Guiding the selection and development of each distinctive capability is people's orientation for knowing and making contributions to the meta-processes through which products and services create value for customers. These contributions are often in novel, unique and differentiating ways that contribute to the performance, cost, quality, sustainability, and reliability of the firm's products and services. Being

involved in these activities creates awareness of their own and other companies' processes and products. Capability-building involves a knowledge-creating and deployment cycle – taking an idea, putting it into action, testing and refining it, finding success, and then teaching what was learned to others. That foundation guides the widespread action needed to scale up efforts, so that the approach becomes the known and accepted way for people to think and operate. As such, capability-building draws upon and reifies the organization's culture.

Third is a system awareness and understanding that comes from examining the people, processes, structure and resources and their relationships to one another in order to develop and integrate capabilities. Each distinctive capability is a unique and essential element to an overall approach for delivering value. Multiple distinctive capabilities align to generate the value in the company's products and services. A broad range of people in the organization from various levels and multiple units need to all be involved to effectively align these efforts. As in any complex system, the interactions among elements produce emergent behavior with non-linear responses. Endogenous factors – multiple cause-and-effect relationships, interactions, non-linearity, and delays – lead to unpredictable, emergent behaviors. An awareness and understanding of a system and its elements expands the narrow functional or product view that improves only that piece and often sub-optimizes the overall system performance.

Fourth is considering what it will take to go from achieving better results to improving the abilities to continually achieve ever better results into the future. Creating, utilizing and integrating distinctive capabilities will result in new and greater awareness. People use that awareness to inform their future efforts in the development, use, integration and refinement of distinctive capabilities. This activity can become a self-reinforcing, virtuous cycle that codevelops people, relationships, and knowledge to produce the ongoing improvements that sustain performance advantages. New actions are guided by the interactions and relationships developed from the feedback and learning from previous actions. The virtuous cycle is enabled by system effects² and is something that other companies cannot match, or even see their way to being able to match. In a complex system, leaders cannot directly control or adequately guide their organizations to superior gains by centralizing decision-making and goal setting, but instead need to invest in and enable ways to appropriately empower and align many people's choices and behaviors toward common goals.

Conclusion and management implications

In summary, while we were able to describe what we saw and heard in companies that developed and deployed distinctive capabilities, we also observed that creating distinctive capabilities and capability systems is a time-consuming, complex and difficult endeavor. The survey statistics around strategy and its implementation report only a minority, less than 10% of leaders and their companies, as great in both strategy and its execution [1]. We propose that one possible explanation for these difficulties is that the management research and literature has not yet sufficiently studied and applied the capabilities concept. Yet, we clearly

found that the broad-based, multilevel elements associated with identifying, developing and using distinctive capabilities and capability systems, found in the fourteen *Strategy that Works* companies, provides the context, information, and concepts needed to guide their endeavors. We realize that it is not the only path to sustained success, but it is one that if followed by other companies would seemingly benefit them. Making those efforts and getting those outcomes creates and sustains enormous benefits for the people, their company, its shareholders and their customers.

The insights for building distinctive capabilities have promise for management practice. We propose that there are important parallels with two previous management innovations; innovations in how organizations and their efforts were organized that created significant performance benefits. Both innovations have been widely adopted and are accepted as conventional management practice. These innovations were cross-functional teams [24] and value stream management [25]. Each enabled and achieved significant gains for the organizations that adopted them. Initially those operational improvements provided substantial competitive advantages, which have lessened as they have become accepted management

1. Focus Requisite Attention
2. Create Broad Engagement
3. Utilize Systems Awareness
4. Initiate a Virtuous Cycle

practices. Cross-functional team and value stream management created ways of organizing and operating that brought individuals together in new ways and provided a new focus, an alternative organizational approach, and better use and engagement of people. We anticipate that a focus on and adoption of distinctive capabilities in strategy and its implementation will provide similar benefits for the organizations that embrace this approach.

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Endnotes

- ¹ John Kay, economics professor at London Business School, developed a Distinctive Capabilities Framework in his 1995 “Foundations of Corporate Success.” [27]. He proposed three distinct capabilities: reputation, architecture and innovation. A company has to use any one of the distinctive capabilities to be successful and sustain that success. These capabilities are unique and give a company an edge over its competitors.
- ² A system effect is when “(a) a set of units or elements is interconnected so that changes in some elements or their relations produce changes in other parts of the system, and (b) the entire system exhibits properties and behaviors that are different from those of the parts.” Systems are often characterized by nonlinearities, where an effect is greater than the sum of the effects of the actions taken by multiple actors; feedback, where actions may amplify the problem; indirect effects, where an incidental action becomes more important than the primary intention; contingencies, where an effect depends on initial actions; interaction effects, where behavior of one actor changes the environment and others do not respond as predicted; and unintended consequences, where long-term effects diverge from desired outcomes, [26].

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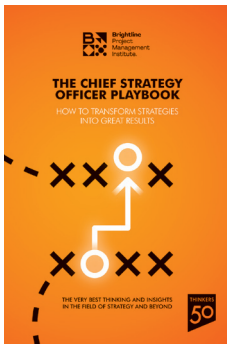
The panels each day provided context and transition across the paper sessions. Thanks to Corinna Ellis, Tom Meagher, Carol Ann McDevitt on the practitioner panel and Edivandro Carlos Conforto, Joseph Oehmen, Eric Rebentisch, and Kenji Tanaka on the research directions panel.

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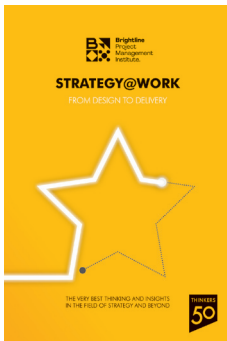
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